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The views expressed in independent reports prepared for the Forest Resources Commission are those of the authors and not necessarily those of the Commission. They are published in their entirety for the use and interest of the public as background studies to the April 1991 Report of the Commission to the Minister of Forests.

REFORMING THE DECISION MAKING PROCESS FOR FOREST LAND PLANNING IN BRITISH COLUMBIA

Final Report

to the

Forest Resources Commission

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1.0 INTRODUCTION

One of the principal issues in forestry in British Columbia is the management of land to support competing uses. The issue is so intense that the B.C. government appointed a special Wilderness Advisory Committee (WAC) in 1987 to investigate the conflict between wilderness and extractive uses. More recently, the Task Force on Environment and Economy identified land use management as the focus for much of the environmental concern in British Columbia. Concerns regarding land use conflict were also prevalent in the recent provincial government hearings on Tree Farm Licences (TFLs) and in the hearings conducted by the Forest Resources Commission (FRC).

While much of the discussion on land management deals with conflict in specific watersheds such as the Stein and Carmanah, the discussion has also focused on the nature of the decision making process. The WAC and the Task Force, for example, both recommended the need for a revised land use decision making process. Indeed, sound integrated land use planning depends on a good decision making process that ensures that diverse concerns of the various stakeholders and the public are adequately taken into account in the final decisions.

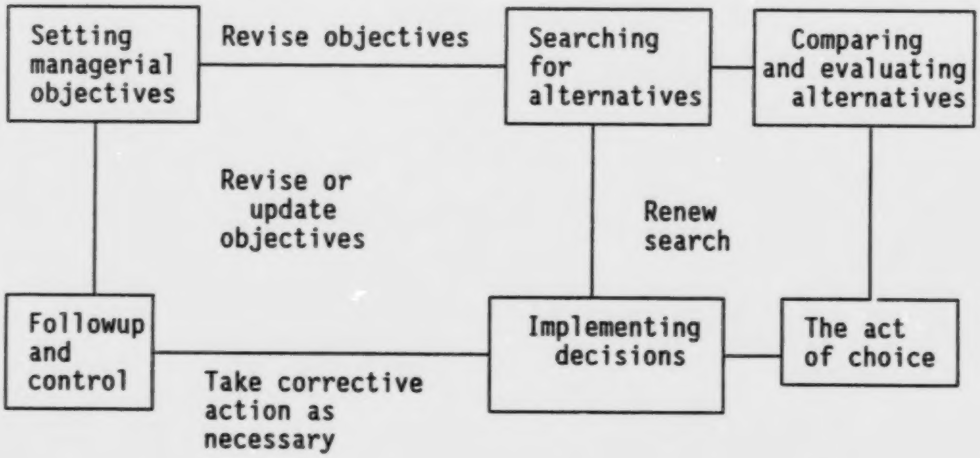
The purpose of this report is to synthesize the findings of a series of background studies analyzing the decision making process for crown land planning in British Columbia. The report begins with a brief discussion of the characteristics of the land use issue, followed by a discussion of the characteristics of an effective decision making process. The process currently used in British Columbia is evaluated relative to these criteria. Finally, several alternative land use decision making processes are evaluated. Those wishing more detail on particular points should refer to the relevant background paper.

It should be emphasized that this paper deals only with the decision making process for land use allocation and management. It does not deal with forest policy issues such as tenure, community development, logging practices, stumpage and silviculture per se. Nor does it deal with native land claims. While these issues are important, they are outside the terms of reference of this research paper. It should also be emphasized that the options outlined in this paper are presented in a conceptual fashion to stimulate discussion. Additional research is required to provide specific details necessary for implementation.

2.0 THE DECISION MAKING PROCESS

Decision making is normally described as a process moving through a sequence of steps. Goals and objectives are identified, options are evaluated and the best option is chosen and implemented. Impacts are then monitored to measure the success of the management strategy. The process continues as management strategies are revised in light of changing circumstances. The process is summarized in Figure 1.

Figure 1


Setting managerial objectives
Revise objectives
Searching for alternatives
Comparing and evaluating alternatives
Revise or update objectives
Renew search
Followup and control
Implementing decisions
The act of choice
Take corrective action as necessary

Government decision making for public resources such as crown land is particularly complex. Democratic governments should be responsive to their electorate through what can be termed "due process" protecting individual rights. The elements of due process are outlined below. At the same time, governments must reach efficient decisions in a timely manner at reasonable cost. The challenge is to develop a decision making structure that follows due process and is efficient.

3.0 ELEMENTS OF A GOOD DECISION MAKING PROCESS

More specifically the elements of a good public sector decision making process can be summarized as follows:

1. The decision making process should be formally structured through legislation or regulations. This will ensure that the process, information requirements, objectives and responsibilities of various participants are fully understood. Performance and accountability are easier to judge when the decision structure is explicit.

2. The decision making process should be based on sound information generated by appropriate analytical techniques. Suitable techniques for analyzing forest land use decisions are outlined in the accompanying report on methods of analysis. The comprehensiveness of information generated should be determined on the basis of costs and benefits of additional analysis.

3. Stakeholders, defined as those significantly affected by a decision, need to have the opportunity to participate effectively in the decision making process. In part, this is achieved by electing representatives through the formal political process. Given the lags between elections, the large number of issues and the sometimes tenuous link between elected representatives, their constituents and the bureaucracy, the formal electoral process can be improved by direct participation of stakeholders in individual decisions affecting their interest. Direct participation has several advantages. First,

stakeholders are able to provide decision makers with important information on issues such as goals and objectives and impacts of alternative management strategies. Second, by allowing stakeholders to participate directly in the process, potential conflict and opposition may be reduced. This increases the probability of formulating and implementing a sustainable management strategy.

Effective direct participation requires the following:

a) Stakeholders need information on the decision making process including timing, criteria and role of various actors in the process. Such information should be available in a comprehensive written document.

b) Stakeholders need adequate resources to participate.

c) Stakeholders need timely access to information utilized in the decision making process.

d) Stakeholders need formal and timely notification of all major upcoming decisions and the opportunities they have to participate in those decisions.

e) Stakeholders need an opportunity to present their input and to review and comment on the input of other participants.

f) Stakeholder participation should not be restricted to reacting to proposals. Instead, stakeholders need an opportunity to participate throughout the process. This can reduce potential conflict by ensuring early inclusion of stakeholders' concerns and identification of potential solutions in a constructive forum.

g) Decision makers should be obligated to provide stakeholders with a written decision summarizing how key decisions were reached and how the various concerns expressed by stakeholders were taken into account.

4. The decision making process should be efficient. Decisions should be reached in a timely manner at reasonable cost. Indefinite delays caused by excessive appeal processes and/or unclear delineation of decision making authority should be avoided. Also, information collection and analysis should be suited to the specific issues and problems encountered. A common deficiency in many decision making processes, for example, is to require a costly, comprehensive data inventory and analysis regardless of the issue at hand. The result is that substantial resources are expended collecting and analyzing superfluous information. The preferred option is a strategic decision making process that commences with a preliminary strategic overview which is utilized to focus further analysis on key issues as required.

5. The decision making process should be flexible enough to accommodate diverse land use management problems. This necessitates some degree of discretion. Discretion, however, should be exercised within a structured framework specifying the circumstances and criteria to be used in exercising discretion.

6. The decision making process should ensure an equitable outcome by providing compensation to stakeholders left worse off by a decision. If the decision is in the public interest, the benefits should exceed costs, leaving adequate resources to compensate those made worse off.

7. Those responsible for making the final decision must be impartial, adequately represent the broad public interest, possess relevant expertise and be directly or indirectly accountable through the democratic process to those affected by the decision.

8. Implementation of land use decisions should be monitored to measure the success of the management strategy. The monitoring process should be clearly prescribed and the results should be available to all interested parties.

9. An appeal process should be available to allow stakeholders to challenge land management decisions which contravene due process or are inconsistent with prescribed guidelines or objectives. The appeal process should be defined narrowly to ensure that the appeal is not used as a mechanism for simply transferring decision making authority to an appeal tribunal or causing lengthy and costly delays. The appeal tribunal should have expertise in land use management and administrative process.

10. Mediation and negotiation techniques should be utilized when possible to reduce conflict or achieve consensus. The process should encourage constructive conflict resolution as opposed to confrontation.

4.0 THE FOREST LAND PLANNING PROCESS

The legislative basis of forestry planning is contained in the Ministry of Forests Act which sets out the functions of the Ministry of Forests and the Forest Act which provides the legislative basis for managing crown land that is in Provincial Forests. Approximately 85% of the land base in British Columbia is subject to the Forest Act.

The MOF planning process is summarized in Figure 2. MOF is legally bound to prepare a ten year resource analysis plus an annual report outlining management priorities for the next five years. These plans include silviculture programs to increase the productivity of the forest base.

The MOF process calls for the establishment of regional priorities in consultation with government officials. To date, no comprehensive regional priorities have been established.

The next level of planning involves preparation of resource management plans for Timber Supply Areas (TSAs) and Tree Farm Licences (TFLs). Resource management plans provide the broad, 20 year management strategies for each TSA and TFL. These plans contain a summary of the major issues and objectives for the respective TSA/TFL, quantitative targets for timber, range, and recreation uses, and proposed management strategies for achieving these targets. MOF is obligated under section 4(c) of the Forests Act to incorporate timber as well as non-timber values in the planning process.

Currently, the preparation of a TSA plan is managed by a steering committee normally comprised of MOF staff and industry representatives. Sometimes representatives from other agencies are included. In response to a recommendation by the Forest Resource Commission, MOF decided to create district planning committees to prepare the plan. The district planning committees will be chaired by MOF staff with representatives from relevant government agencies. In future, the specific form of public involvement will be at the discretion of the district planning committee. It is currently at the discretion of MOF staff. The policy is to invite public input on the initial identification of issues and the draft TSA plan. Depending on the decisions of local staff, additional mechanisms for public involvement such as public meetings, workshops and task forces may be utilized. After public input is received, the draft

TSA plan is submitted to the Chief Forester of the province who has authority for its contents and approval.

The planning process for TFLs is similar to TSAs except that the TFL licence holder instead of a steering committee is responsible for preparing the TFL plan. The licence holder is obligated to notify the public when the initial issues and management objectives are identified and when the final draft TFL plan is ready for submission to the Chief Forester for approval. Input is also sought from relevant resource agencies. At each stage, the public has the right to review and comment on the relevant documents.

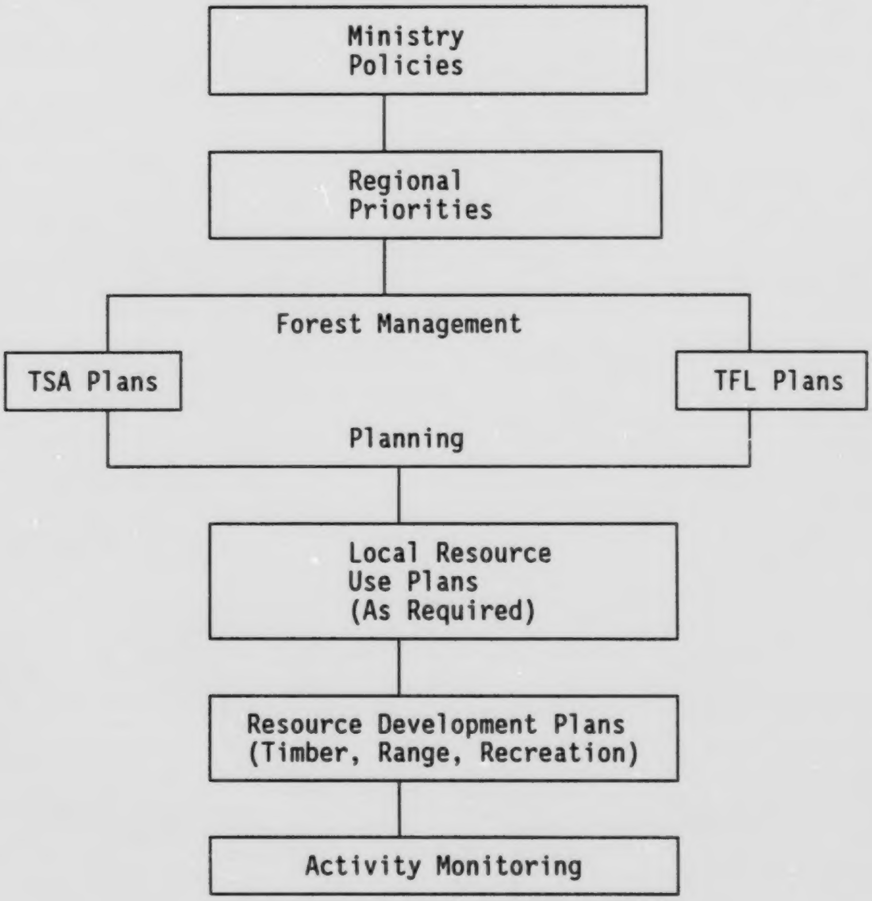
The next level of planning, termed local resource use planning, is undertaken for special resource problems within TSAs. At the discretion of MOF, a process may be initiated for these special issues involving the preparation of detailed integrated resource plans, often under the guidance of special advisory committees representing the various stakeholders. Examples of such planning efforts include the Trench plan and South Moresby plan. The responsibility for implementing local resource use plan recommendations may be handled by the district MOF manager, the Chief Forester or Cabinet, depending on the recommendation.

Resource development plans represent the most detailed level of the planning process. They are specific plans outlining the planned resource development for those sections of each TSA and TFL expected to be harvested over the next five years. Location of logging, logging guidelines and other specific proposals are included. These plans are prepared by MOF staff or the forest companies at the district level and are updated each year. These plans are available for public review and comment. Implementation of plans at the site level requires approval of pre-harvest silviculture prescriptions.

Figure 2

Ministry of Forests

Forest Planning Framework


Ministry Policies
Regional Priorities
Forest Management
TSA Plans
TFL Plans
Planning
Local Resource Use Plans (As Required)
Resource Development Plans (Timber, Range, Recreation)
Activity Monitoring

5.0 EVALUATION OF B.C. FOREST PLANNING

5.1 Involvement of Stakeholders

a) Understanding the Process

Many stakeholders are poorly informed about the nature of the MOF land planning process. There are documents, such as Forest Planning Framework produced by MOF, that describe the existing planning process, but no single comprehensive document is available which describes the roles of various participants, the decision criteria employed and the process. Indeed, during the preparation of these studies, the study team had to expend considerable effort reviewing numerous documents and legislation and conducting interviews to understand the process. Even in instances where stakeholders have been invited to participate in a special advisory committee overseeing the preparation of a local resource plan, their roles have not been clear.

b) Notification

In the case of TSAs, forest industry and relevant government agencies guide development of five year TSA plans through their representation on the steering committee and the planning committee. In the case of TFLs, the resource management plan is prepared by the licensee and reviewed by relevant government agencies. Notification of other stakeholders, however, is not as effective. TFL holders are obligated to notify the public when issues are identified at the commencement of the TFL planning process and when the TFL draft plan is completed.

MOF normally notifies the public at the commencement of the TSA planning process. The guiding principle, however, is that if stakeholders want to be involved in the process, they will let agencies know. Although some MOF staff actively solicit broad stakeholder involvement by direct contacts with potential participants, there is no explicit requirement for this.

c) Extended Involvement

Forest industry stakeholders are fully involved in the preparation of TSA/TFL management plans. They have responsibility for developing the TFL plan and are involved in the preparation of TSA plans through their representation on the TSA steering committees. Various government agencies are also represented in the TSA steering and planning committees. They are not as actively involved in the TFL planning process. Both industry and government agencies are also represented in the more detailed local resource use planning process which is often guided by a special advisory committee.

Other stakeholders, however, are not provided with the same opportunity for extended involvement. In TFL planning, they are allowed to comment on issues identified at the commencement of the TFL planning process and on the draft TFL plan. They are not active participants in the plan development. In TSA planning, they are provided with the opportunity to comment, but are not normally directly involved through ongoing representation on TSA steering committees or the planning committees. At the discretion of MOF they may be invited to participate in special advisory committees created to prepare a local resource plan. The public is encouraged to review and comment on the more detailed resource development plans outlining proposed harvesting guidelines for the areas of the TFL and TSA to be logged. There is no opportunity for extended involvement in preparation of these detailed resource development plans.

d) Resources to Participate

Major stakeholders such as the forest industry and government agencies have resources to participate in the planning process. Many stakeholders, however, have inadequate resources to review draft plans, let alone participate fully in plan development. Unlike their industry and government colleagues, representatives of environmental groups, for example, do not have sufficient budgets to hire a large staff of experts. Overall, there is significant inequality between stakeholders' abilities to participate.

e) Information Availability

MOF released a new policy explicitly providing for the disclosure of non-confidential information to stakeholders in December, 1989. The implementation of this policy is constrained by insufficient resources to generate and provide the information requested. There is also some concern regarding the definition of confidential information. Unlike more formal hearings, stakeholders do not have a formal right to request other stakeholders or government agencies to undertake special studies to provide relevant information. The problem is most acute for TFLs where licensees are allowed to keep basic management information such as growth and yield data confidential on the grounds that it is proprietary corporate information.

f) Written Decisions

MOF policies stipulate that MOF staff must give written reasons justifying decisions not to implement public recommendations. This is not effectively implemented. Also, justification of decisions by the Chief Forester on the proposed TSA and TFL management plans or local resource use plans is not provided in a comprehensive document outlining the criteria utilized, the reasons for the decision and the response to stakeholders' concerns. Consequently, it is difficult for stakeholders to ascertain why decisions were made and how their concerns were dealt with.

5.2 Explicit Decision Making Framework

Although many aspects of the planning process such as the requirement to prepare working plans are contained in legislation, some planning procedures employed by MOF such as the access to information policy, the public participation program, decision making criteria and analytical requirements for plan preparation are provided in policy documents lacking legal force or certainty. Consequently, important aspects of the decision making process are not formally structured in legislation and/or regulations. This allows for a high degree of administrative discretion.

5.3 Methods of Analysis

The analytical techniques utilized by MOF are outlined in the accompanying final report on methods of analysis. The major deficiencies of the current analytical process are the unsystematic assembly of information by the relevant agencies, the ad hoc nature of issue identification and the lack of a comprehensive framework which reconciles assumptions and values in an explicit fashion suitable for assessing tradeoffs.

5.4 Representative Decision Maker

Ultimately, provincial Cabinet has the responsibility for making land management decisions. Cabinet and the legislature are designated representatives of the public interest. There is some debate on the appropriate allocation of decision making powers between central democratic institutions representing the provincial interest and local democratic institutions representing regional interests.

Although Cabinet retains its role in broad land use allocation decisions involving the classification of land into parks or provincial forests, much of the decision making power has been delegated directly to civil servants such as the Chief Forester who approves TSA and TFL management plans. The Chief Forester is required under the Forest Act to consider timber and non-timber values. The extent to which the Chief Forester is able to represent adequately all these various stakeholder interests is debatable. Although the interests of other agencies and stakeholders representing environment and wildlife concerns are be taken into account, MOF is a line agency with a dominant orientation. It is clearly unfair to expect its members to represent adequately all stakeholder interests.

5.5 Efficiency

Overall, the preparation of resource management plans is efficient. Plans are prepared in a timely and cost efficient manner following a strategic planning process. Broad strategic overviews are prepared for TSAs and TFLs and more detailed plans on specific issues and conflicts are prepared as required.

5.6 Equity

The only formal provision for compensation is for holders of timber licences who experience a reduction in the license area resulting in a reduction of the AAC of more than 5%. Although special arrangements for compensation have been made in cases such as the creation of the national park on the Queen Charlotte Islands, there is no formal mechanism providing compensation for forest workers laid off as a result of management decisions or other user groups such as trappers or fishermen who are negatively affected by logging. The issue of compensation, however, is a complex issue beyond the parameters of this report. Suffice it to say that the issue of compensation deserves a comprehensive review.

5.7 Monitoring

In a recent Ombudsman report, concerns were raised about the adequacy of monitoring land management. Indeed, a recent study of logging on Lyell Island showed widespread infractions. Clearly, resources available for monitoring are inadequate.

5.8 Flexibility

The MOF planning process is flexible. Unique planning processes can be created to accommodate diverse planning problems within a comprehensive planning framework. As the creation of the Wilderness Advisory Committee and the Forest Resources

Commission indicate, there is also adequate provision for unique initiatives outside the MOF planning process.

5.9 Appeal

There is no provision for appeal of planning decisions to any independent third party when process or policy has been contravened, other than the normal appeal to courts on questions of law and jurisdiction.

5.10 Mediation

There is no adequate mechanism for training or providing expert mediators to assist in forest land planning. Unfortunately, the decision making process is characterized by confrontation as opposed to cooperative negotiation.

6.0 REFORMING THE DECISION MAKING PROCESS

The forest land planning process in B.C. has many attractive features. Nonetheless, as the previous section on evaluation indicates, the existing forest planning process can be improved. The following proposals are made for more effective decision making for land use planning.

1) The elements of the decision making process including the roles of participants, procedures, planning objectives, decision criteria and analytical requirements should be incorporated in a legislative framework providing a clear and consistent decision making structure. Incorporating existing policies on public participation and access to information, for example, into legislation would

improve clarity and accountability. Care should be taken to ensure that the legislative framework provides sufficient administrative discretion and flexibility to adjust to different circumstances. Regulations approved by Cabinet, for example, are more flexible than legislation which must be passed by the legislature. The scope of discretion should be carefully specified in the legislative framework.

2) The principal mechanism for land management should be an officially approved TSA/TFL regional resource plan outlining the allocation of land between alternative uses, zoning guidelines enforcing land use allocation, management guidelines regulating activities in each zone and resource development targets such as the AAC. The plan would be an extension of existing TSA/TFL resource management plans. Regional boundaries, however, may have to be adjusted to facilitate effective regional planning. The approved plan would have legal force and a clearly defined process for amendment. More detailed resource development and operating plans would be prepared within the parameters of the TSA/TFL plans by MOF staff.

3) The decision making process should be outlined in a comprehensive and comprehensible document and an education program should be implemented to inform stakeholders of the nature of the process and the opportunity they have to participate.

4) Notification requirements should be incorporated into legislation. Such requirements should ensure sufficient notification for all important forest land planning decisions including the initiation of various stages in the TSA and TFL planning process, the initiation of various stages in any local resource use plans

and in resource development plans. Notification requirements should be extended to cover non-forestry planning activities such as mining, energy development, parks and large development projects. Notification should outline the opportunities to participate and invite participants to become involved. Notification should also require that all major stakeholders expressing interest are separately contacted and informed of the process.

5) Stakeholders should have a reasonable opportunity to participate in the development of plans throughout all stages of the planning process. Stakeholder representatives should be invited to participate directly in planning committees.

6) The B.C. Participation Fund should be created to assist stakeholders with a significant interest in a particular plan who have insufficient resources to become involved in the planning process. The fund should be managed by a separate provincial agency independent of the planning process. Allocation of funds should be based on explicit criteria developed in collaboration with provincial stakeholder groups. Criteria employed by various agencies such as the Ontario Energy Board which provide intervener funding could assist in the development of funding guidelines to ensure a reasonable and fair allocation of funding.

7) Stakeholders need improved access to information. This could be accomplished by comprehensive provincial freedom of information legislation and provision of sufficient resources to MOF to respond to information requests.

8) An independent, endowed forest management research centre should be created to undertake independent research on behalf of stakeholders and the public.

Such research would allow stakeholders to be more effective participants in the planning process.

9) A provincial mediation centre should be created to provide independent expert mediators to participate in various planning committees to assist them in resolving disputes.

10) Although efforts should be made to achieve a consensus, stakeholders still require a forum in which they can question assumptions and state positions prior to final plan approval. To achieve this objective, proposed TSA/TFL resource plans should be reviewed through a formal public hearing prior to approval, if there is sufficient interest. The public hearing should be structured to allow stakeholders to present input and review and comment on the input of others including those submitting the TSA/TFL plan. Because the more detailed resource development and operating plans would be prepared within the parameters of the TSA/TFL plans, they need not be subject to the same hearing process.

11) The approval of TSA/TFL resource plans should be provided in written decisions outlining the reason for the decision, the criteria employed and the response to various stakeholder input. All participants should receive the written decision and be informed of the opportunities they have to appeal the decision.

12) A new Resource Appeal Board should be created to hear appeals from the public. The basis of appeals should be narrowly defined to include only questions of compliance with due process in plan formulation and compliance

with officially approved planning guidelines. The creation of this specialized appeal board will expedite planning by keeping the appeals out of the normal judicial process. Appeal procedures should be expeditious to avoid costly and lengthy delays.

13) A common geographical information system and comprehensive guidelines for analysis of land use options similar to those used by the U.S. Water Resources Council should be prepared. The guidelines should be based on a multiple accounts framework which incorporates all relevant factors into the analysis. The guidelines should also summarize the circumstances in which various analytical methods should be employed. An iterative process in which less expensive techniques such as biophysical overlays are used to provide an initial assessment of potential land use conflicts and more advanced techniques such as multiple accounts are used only as required for complex conflicts is preferred. (For more discussion of these points, the companion report on methods of analysis should be consulted. See Gunton and Vertinsky, Methods of Analysis for Forest Land Use Allocation.)

14) Sufficient resources should be made available for monitoring the implementation of TSA/TFL resource plans. Mechanisms such as publication of annual performance reviews and the right of stakeholders to challenge non-compliance through the Resources Appeal Board should be utilized.

7.0 REFORMING DECISION MAKING AUTHORITY

The previous section contained proposals for improving the decision making process. Regardless of the process employed, someone has to be given the responsibility for making the final decision. Several alternative structures for allocating decision making authority are summarized below. The alternatives have been developed on the basis of a review of other jurisdictions, previously existing structures in British Columbia such as the Environmental and Land use Committee (ELUC) secretariat and regional resource management committees used in the 1970's and various proposals for reforming the B.C. planning system.

7.1 **Revised Status Quo**

The current system of decision making for forest land planning incorporating the proposals outlined in section 6.0 is summarized in Figure 3 . In this system, approval of TSA/TFL plans still resides with the Chief Forester. Responsibility for preparing the TSA and TFL resource plans is held by the TSA district planner and the TFL licence holder respectively. The key changes from the status quo include the Resource Appeal Board which hears appeals on questions of process and compliance, the B.C. Participation Fund which provides assistance to stakeholders, the B.C. Mediation Centre which provides expert mediation services and the B.C. Forest Research Centre. The major change in process is that the Chief Forester or designate is required to conduct a formal public hearing prior to TSA/TFL plan approval if warranted by sufficient interest. Some potential advantages and disadvantages are as follows:

Advantages:

1) The structure of authority results in timely decisions at reasonable cost.

2) The decision maker (Chief Forester) has expertise in resource management.

3) The decision maker has a provincial perspective.

4) The decision maker is politically accountable to Cabinet.

5) Decision making and implementation is delegated to the same agency (MOF). Implementation may be more effective.

	6)	This option involves minor changes. The risk and uncertainty for investors is therefore low.
Disadvantages	1)	The decision maker is not accountable directly to regional interests which may be most affected by the decision.
	2)	The Chief Forester and the steering committees may not adequately represent non-forestry concerns which should be incorporated into the decision.
	3)	The TFL licence holder does not adequately represent broad stakeholder concerns.
	4)	Relative to the other options considered in this report, the decision making process is still somewhat closed with decisions being made in a government department through a normal hierarchical process. The reduced pressure to justify decisions in an open public forum can reduce the quality of decision making and analysis. Also, traditional government decision making can be more susceptible to special interest group lobbying.

7.2 Regional Resource Management Committees

This option is summarized in Figure 4. The revisions include incorporating broader stakeholder representation on the steering committee, renamed the Regional Resource Management Committee (RRMC) and utilizing the steering committee and interagency planning committee structure for preparing TFL as well as TSA plans. Representation on the steering committee could be by election or appointment by the province.

The advantages and disadvantages of this option are similar to the revised status quo option discussed above. The principal advantage of this proposal relative to the revised status quo is that it broadens the perspective in preparing TSA/TFL plans by including the public in the RRMCs. The disadvantage is that it may increase the uncertainty and difficulty of preparing TSA/TFL plans.

7.3 Independent Board

Under this option, the TSA/TFL plan would still be prepared at the regional level under the direction of the Regional Resource Management Committee. The difference between this proposal outlined in Figure 5 and the previous two proposals is that TSA/TFL resource plan approval has been transferred from MOF to a new B.C. Integrated Resource Planning Board appointed by the Lieutenant Governor and representing various agency and stakeholder interests. Expertise in resource planning and administration would be the basis for appointment. The Board would also have a professional staff likely comprised of transfers from existing government departments. Plan approval would be made after a hearing on the proposed TSA/TFL plan in the respective regions. In cases where there is insufficient interest, the Board could approve the plan without a hearing. Responsibility for approval of more detailed resource development plans would be retained at the regional level either through the RRMCs or MOF staff.

The hearing would follow the normal hearing process used by agencies such as the B.C. Utilities Commission and the National Energy Board including full disclosure of all information utilized in making the decision, submission of information requests, submission of evidence and final argument, right to cross examination and written decisions. Potential advantages and disadvantages are as follows:

Advantages:

1) Relative to the other options, the decision making process is more open and formal. The necessity to justify positions in an open forum may increase the quality of analysis and reduce the likelihood of special interest group lobbying of decision makers. Such lobbying would be prohibited by law.

2) The decision would be made by experts after reviewing all the relevant evidence.

3) Due to the composition of the Board, the decision should better reflect broad stakeholder interests.

4) The Board is a province-wide agency which should have a provincial perspective.

Disadvantages:

1) The formal hearing process could result in more lengthy and costly decision making.

2) Independent Boards can be less politically accountable than normal government departments. This could also be an advantage because it can result in less short term, politically motivated decision making.

3) This process could increase the uncertainty involved in resource allocation. Increased uncertainty could deter investment.

4) Like the previous two options, a provincial board may not be sensitive to regional interests.

7.4 Decentralized Authority

The difference between this proposal outlined in Figure 6 and previous proposals is that final decision making authority for plan approval resides with the RRMC. Potential advantages and disadvantages of this proposal include the following:

Advantages:

1) Decision makers are sensitive to regional interests.

2) Decision making should be less costly and lengthy because the requirement for additional reviews by outside approving agencies is eliminated.

3) Regional approval by broadly based steering committees could better represent broader, non-timber stakeholder interests that the Chief Forester.

4) Plan implementation could be more effective because implementation and approval would be handled at the regional level.

Disadvantages:

1) Decision making could be less sensitive to the provincial interest than the other proposed options.

2) The decision making process would be more closed than an open hearing process. Consequently, it would be more susceptible to interest group lobbying.

3) Additional resources would have to be provided to regional planners to ensure adequate analysis.

8.0 CONCLUSION

MOF has a comprehensive process for planning and managing the province's land base. MOF has made a concerted effort to improve this process in recent years by developing public participation programs and new integrated planning techniques. MOF deserves credit for its efforts, especially considering the limited resources at its disposal.

Despite these efforts, there are additional changes in the process which should be considered. The process should be outlined more explicitly in a legislative framework that provides certainty as well as sufficient flexibility to adapt to changing circumstances. An education program should be implemented to inform the public of the process. More effort should be made to notify the public of proposed planning exercises and invite their participation throughout the development of the plan. The participants should be provided with sufficient resources and access to information.

Mediators should be provided to expedite plan formulation and final TSA/TFL plan approval should be subject to a public hearing if warranted by sufficient interest. The decision makers should provide detailed written decisions. Adequate resources should be provided to monitor and enforce plan implementation and comprehensive guidelines for analysis of land use options need to be prepared.

Regardless of the process utilized, the key issue is who has decision making power. Four options are presented to help resolve this. Each option contains a new Appeal Board to hear challenges on questions of process and compliance. Each option also includes broader representation in the decision making process. All four options are viable. The choice between them depends on the tradeoff between centralized and decentralized authority and due process and administrative efficiency.

The case for more decentralized decision making is that regional residents are the most affected by regional planning decisions. Consequently, regional residents would have a stronger incentive than central authorities to manage the regional resources to meet regional needs. The case for more centralized decision making is that regional decisions impact on the province as a whole. Important provincial impacts could be ignored by regional residents.

All four structures proposed have elements of decentralization including regional steering committees, district planning committees and public participation. There is also an element of centralization in all proposals. Provincial government staff sit on district planning committees and regional steering committees and the process is conducted within the provincial legislative framework. Nonetheless, the options give different weights to provincial versus regional interests. The proposals also differ in the degree to which they involve the public in the decision making process. The tradeoff is between the objectives of due process and the costs of more complex and uncertain decision making.

It is clear that the current decision making process needs to be improved. Failure to reform the system may lead to increased conflict that itself creates uncertainty and discourages economic activity. While each of the options in this report involves significant changes, they are all viable means for improving forest land planning.

Figure 3

Revised Status Quo

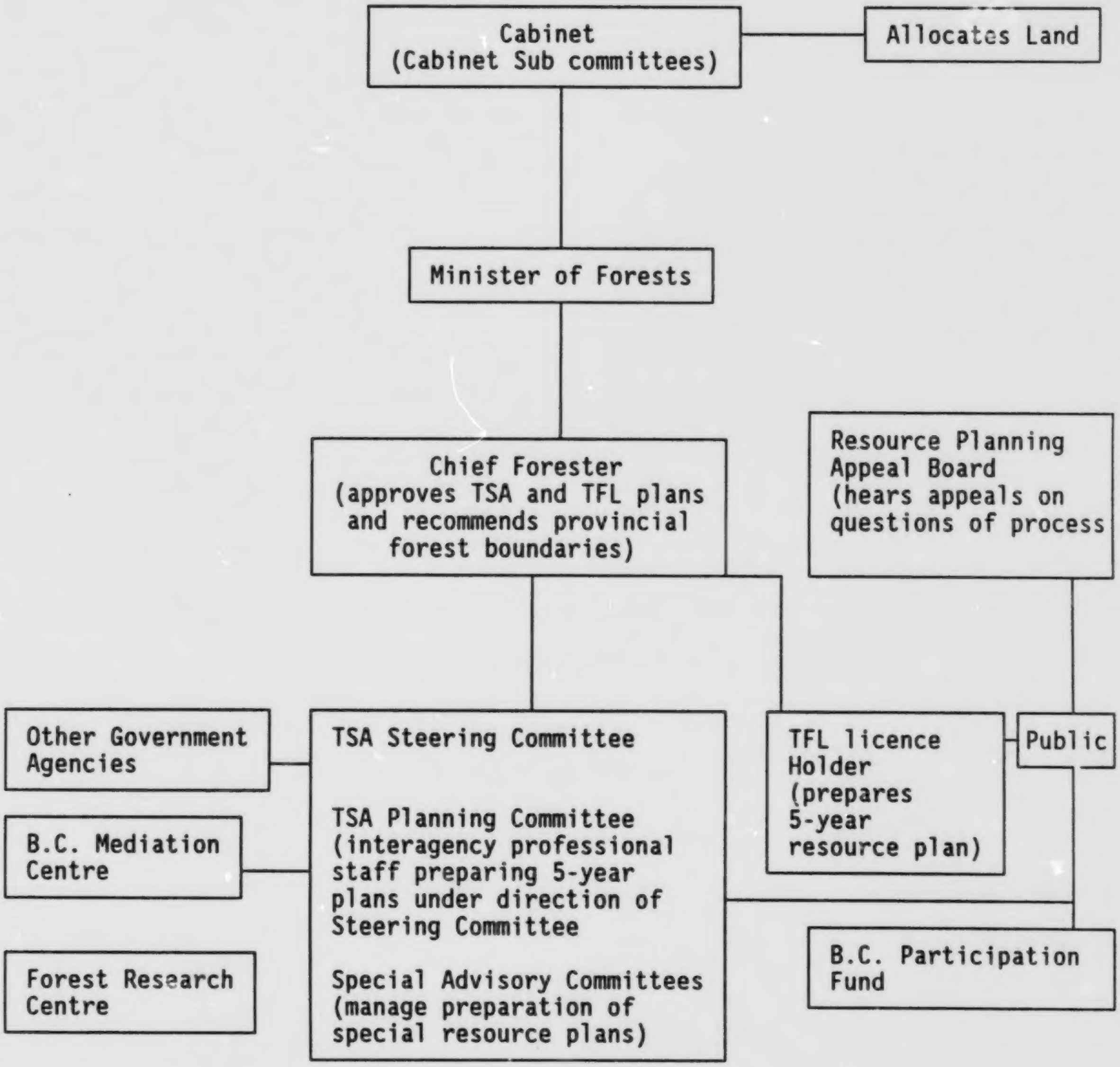
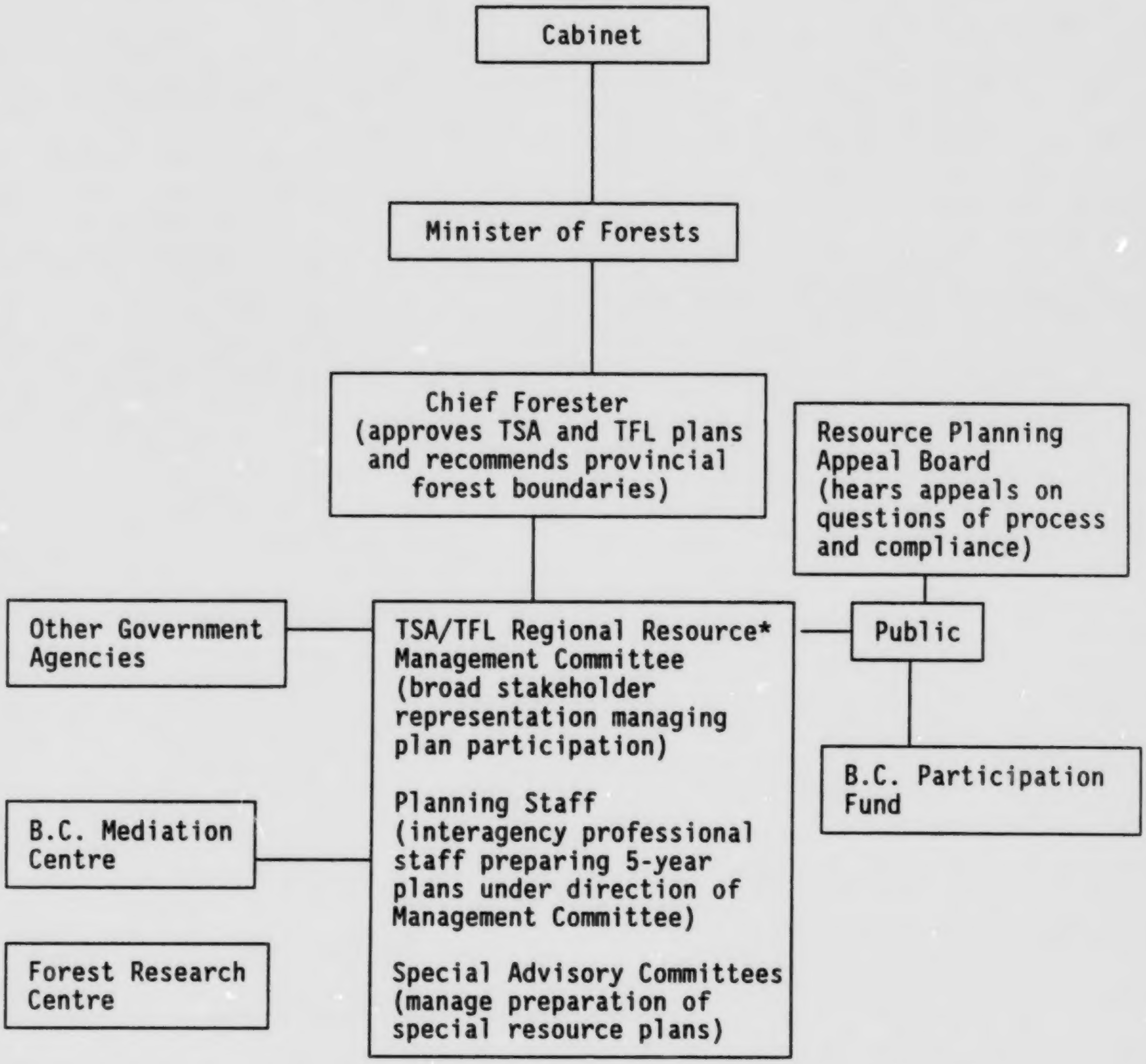

Cabinet
(Cabinet Sub committees)
Allocates Land
Minister of Forests
Chief Forester
(approves TSA and TFL plans and recommends provincial forest boundaries)
Resource Planning Appeal Board
(hears appeals on questions of process
Other Government Agencies
B.C. Mediation Centre
Forest Research Centre
TSA Steering Committee
TSA Planning Committee
(interagency professional staff preparing 5-year plans under direction of Steering Committee
Special Advisory Committees
(manage preparation of special resource plans)
TFL licence Holder
(prepares 5-year resource plan)
Public
B.C. Participation Fund

Figure 4

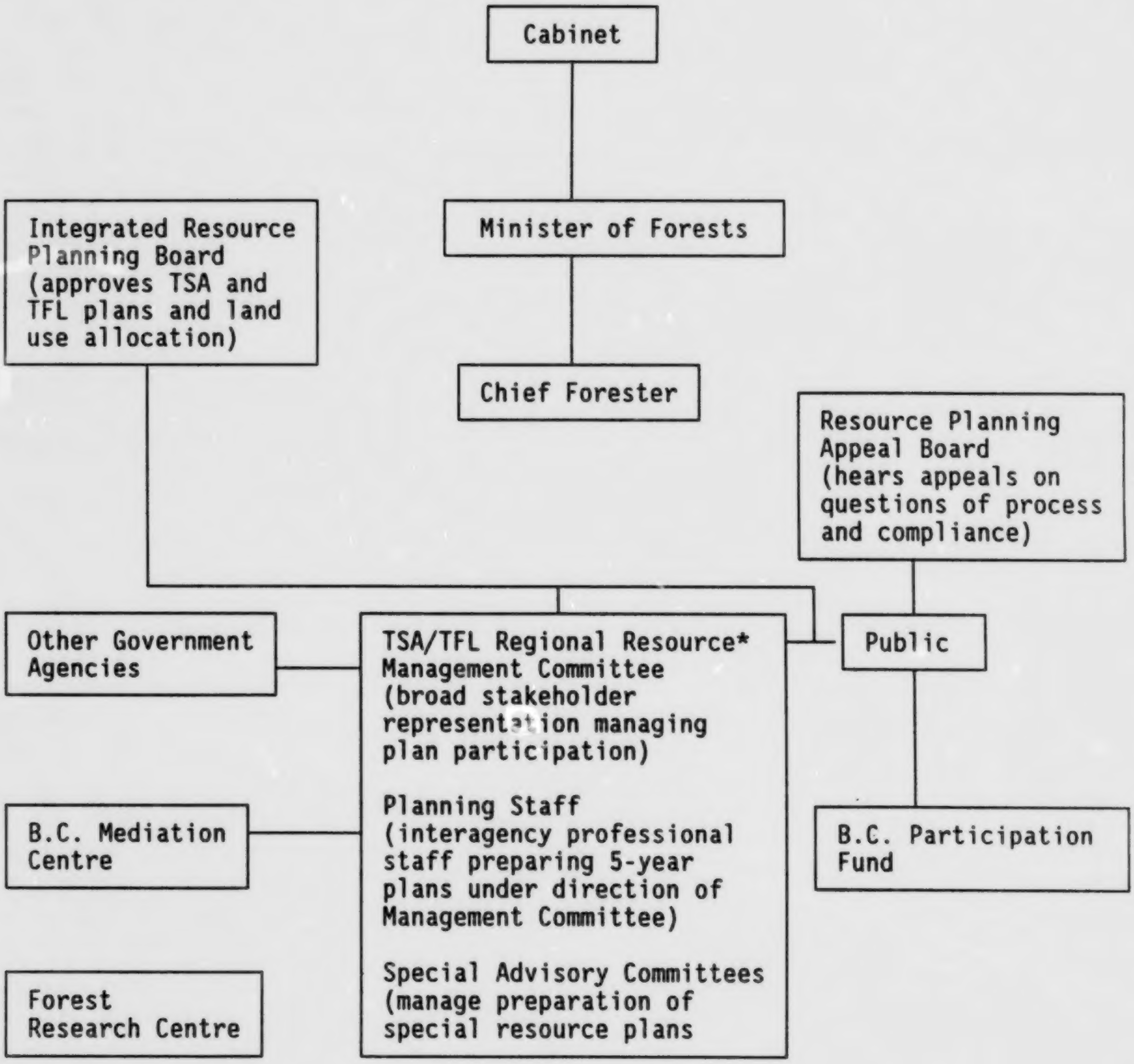
Regional Resource Management Committees


Cabinet
Minister of Forests
Chief Forester
(approves TSA and TFL plans
and recommends provincial
forest boundaries)
Resource Planning
Appeal Board
(hears appeals on
questions of process
and compliance)
Other Government
Agencies
TSA/TFL Regional Resource*
Management Committee
(broad stakeholder
representation managing
plan participation)
Planning Staff
(interagency professional
staff preparing 5-year
plans under direction of
Management Committee)
Special Advisory Committees
(manage preparation of
special resource plans)
Public
B.C. Participation
Fund
B.C. Mediation
Centre
Forest Research
Centre

* may be elected, appointed or some combination thereof

Figure 5

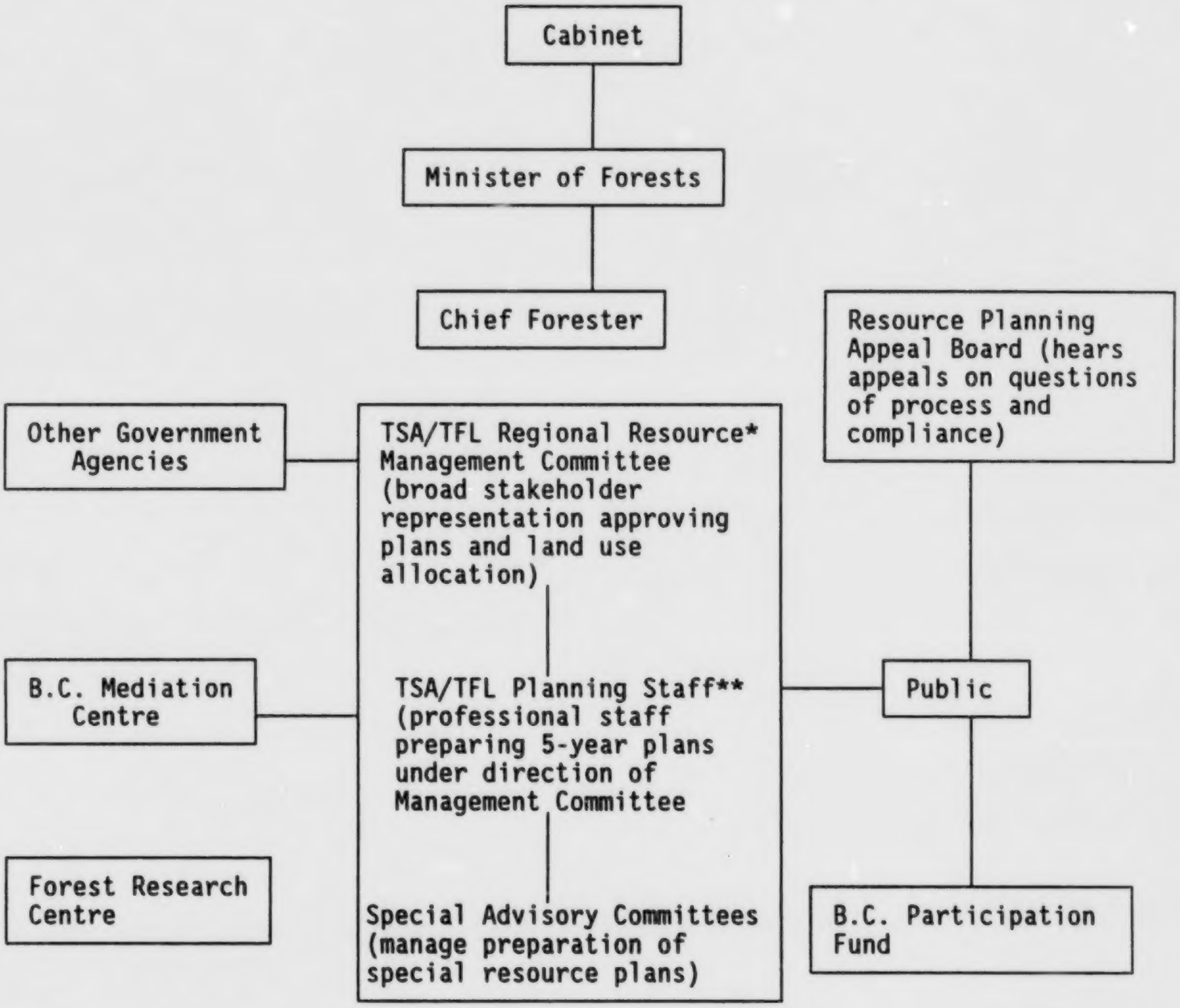
Independent Board


Cabinet
Minister of Forests
Chief Forester
Integrated Resource Planning Board (approves TSA and TFL plans and land use allocation)
Resource Planning Appeal Board (hears appeals on questions of process and compliance)
Other Government Agencies
TSA/TFL Regional Resource* Management Committee (broad stakeholder representation managing plan participation)
Planning Staff (interagency professional staff preparing 5-year plans under direction of Management Committee)
Special Advisory Committees (manage preparation of special resource plans
Public
B.C. Mediation Centre
B.C. Participation Fund
Forest Research Centre

* may be elected, appointed or some combination thereof

Figure 6

Decentralized Authority


Cabinet
Minister of Forests
Chief Forester
Resource Planning Appeal Board (hears appeals on questions of process and compliance)
Other Government Agencies
TSA/TFL Regional Resource* Management Committee (broad stakeholder representation approving plans and land use allocation)
B.C. Mediation Centre
TSA/TFL Planning Staff** (professional staff preparing 5-year plans under direction of Management Committee
Public
Forest Research Centre
Special Advisory Committees (manage preparation of special resource plans)
B.C. Participation Fund

* may be elected, appointed or some combination thereof

** may be interagency planning task force or separate planning staff reporting to Regional Resource Management Committee

METHODS OF ANALYSIS FOR FOREST LAND USE ALLOCATION IN BRITISH COLUMBIA: OPTIONS AND RECOMMENDATIONS

Final Report
to the
Forest Resources Commission

Prepared by

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January 1991

1.0 INTRODUCTION

An essential component of the decision-making process is the generation of technical information assessing the consequences of alternative land use strategies. The purpose of this report is to summarize a series of background papers reviewing alternative analytical techniques for analyzing land use options. Techniques reviewed include biophysical overlays, decision analysis, cost-benefit analysis and multiple accounts.

The conclusion of this review is that a technique based on multiple accounts is the most appropriate technique for analyzing land use tradeoffs. We also conclude that guidelines describing the appropriate application of these techniques should be developed. For more detailed discussion of the techniques, the appropriate background studies should be consulted.

2.0 THE ATTRIBUTES OF A GOOD TECHNIQUE

A choice of a technique presumes appropriate compromise between its advantages and disadvantages. The compromise depends on the nature of the problem and the preferences of the decision maker.

The following dimensions for evaluating a decision technique are based on a review of the literature cited in the relevant background reports:

(1) Comprehensiveness: Does the approach accommodate a comprehensive problem definition, reflect the uncertainty surrounding technical issues, incorporate social values and accommodate new information and insight?

(2) Logical Soundness: Does the approach provide a timely and logically defensible summary of all that it deals with? Are the conclusions derived from decision rules which are sensitive to information, reliable, suitable to the problem at hand and unbiased?

(3) Practicality: Is the approach implementable given the analytic resources, the time and financial constraints, and the constraints in the information base?

(4) Openness to Evaluation: Can assumptions and values underlying the technique be easily identified and their impacts assessed? Is there a clarity of conceptual framework and well-defined procedures?

(5) Political Acceptability and Compatibility with Existing Institutions: Can the technique be implemented given the political and institutional realities without being rejected or overwhelmed by these realities? Can the technique be understood by the public and politicians?

(6) Conduciveness to Learning: Does the application of the technique educate the participants?

(7) Flexibility: Can the technique deal with different situations? and

(8) Decisiveness: Does the technique facilitate choice?

3.0 THE CURRENT STATE OF ANALYSIS IN FOREST LAND USE PLANNING

Typically, the decision to adopt a particular plan in British Columbia reflects a process of bargaining and compromise involving representatives of different ministries in charge of different forest resources. Each ministry (and sometimes departments and branches of the same ministry) employs different analytic techniques to identify what is best from its resource use perspective and to assess the impact of other proposed resource uses. The methods used range from the application of professional judgment to the employment of sophisticated computer optimization techniques. For example, the MOF uses simulation and linear programming models to determine the best harvesting and silvicultural strategy given alternative constraints proposed by the advocates of non-timber uses (e.g., wildlife). The application of these models allows representatives of the MOF to assess the consequences of accommodating non-timber uses in terms of timber values lost. The choice usually is arrived at through informal, unstructured bargaining.

The Resource Planning Manual developed by MOF in 1985 outlines the steps that should be used in the preparation of TSA plans. The steps include informal issue identification which triggers invitations of input from other agencies and the public. This is followed by information assembly involving the systematic identification and synthesis of forestry and other data. Options for alternative uses are generated informally. A baseline option representing the historical or present situation is also included. Options generated are then represented as adjustments to the productive forest land base in the timber supply analysis. Computer optimization models are used to analyze timber supplies. For each option, the associated timber production and future timber volumes available for harvest are computed. Both range and recreation analyses are conducted at this stage as well. The forecasted consequences for each option are compared to the production goals for each resource. At this stage, options which appear to satisfy best the production goals are selected for the consideration of the decision maker.

The problems that implementation of this process encounter are the lack of systematic, compatible assembly of information by the various agencies, the ad hoc nature of issue identification and the lack of an explicit evaluation framework which reconciles assumptions and values in a consistent way.

The MOF is now involved in a major effort to correct some of these flaws. An Analytic Framework for Integrated Resource Management (AFIRM) is being developed in an attempt to systematize and coordinate the analysis of all resources in a TSA. This will be done through the use of a georeferenced data base, a generalized process of resource land base allocation and projection, and a set of management options which pertain to all of the resources in the TSA. Even in this design, the analytic technique for the forest land use allocation decision is left unstructured. However, in a few situations involving high conflict, the ministry has employed the framework of cost-benefit analysis as an input to the decision process.

4.0 BIOPHYSICAL ANALYSIS

The underlying assumption of biophysical analysis is that the utility of land to support alternative uses is based on its biophysical attributes. The application of the method is relatively straightforward: biophysical characteristics of the land area are evaluated, described and summarized on maps. A rating system is devised for each prospective land use such as agriculture, recreation and forestry. Capability maps are then generated for each prospective land use based on the classification system and the biophysical features.

Different biophysical attributes of an area may limit or facilitate a particular land use. Beginning with a knowledge of land use requirements, capability ratings can be determined either by evaluating use limitations relative to the optimal land type, or by compiling a list of specific opportunities offered by the area.

Perhaps the best-known Canadian example of a capability rating system is the Canada Land Inventory (CLI). Most ratings in the CLI are based on limitations to use such as soil fertility, soil moisture and slope limitations to agriculture or forestry food and cover availability for wildlife. Recreation ratings, conversely, are based on specific opportunities, such as beaches, water access, and scenic features. The CLI ratings are for use capability as defined above; that is, inherent productive potential with economically and technically feasible improvements.

After the potential for each prospective land use is evaluated for the entire study area, these ratings can be synthesized into a composite land use map. Such a map might indicate the best prospective use for each unit in the area together with compatible secondary uses. Alternatively, it could distinguish between areas capable of supporting only a single use, and those capable of supporting several. Maps recommending best uses must show clearly the criteria used for the decision. The second type of map is useful in pointing out areas of potential conflict requiring further analysis of the potential for multiple use, or the need for tradeoffs.

Faced with a composite land use evaluation map, the decision maker can decide on a land use plan for the study area. The basis of any decision must be a set of criteria or objectives against which to compare land use alternatives. A set of objectives might include, for example, a specific timber harvest and number of visitor days of recreation potential. Planners could then examine alternative land use combinations shown as biophysically possible on the composite evaluation map. By comparing these alternatives to the stated objectives, the decision maker would choose the best land use combination.

The availability of high-powered, fast computers allows the implementation of the biophysical analysis system with more flexibility and display capabilities that facilitate professional judgment and bargaining.

Geographic Information Systems (GIS) can be used to overlay data and information themes pertinent to the management of each resource. Composite maps can easily be created to aid the biophysical analysis and help decision makers decide upon use trade-offs by experimenting with alternatives in the GIS environment.

4.1 Evaluation of Biophysical Analysis

The advantages of biophysical analysis are that it is flexible and easy to understand. It provides a structure for information concerning resource use. Also, with the powerful GIS systems now available it can facilitate informed discussion and bargaining about forest land uses. The problem with biophysical analysis is its lack of a systematic conceptual framework for generating biophysical capability ratings and its exclusion of significant factors such as economic criteria. The framework provided by biophysical analysis is not oriented to decision making, except for its use as a screening device (showing what the land is not capable of producing) and a device to highlight conflict potential. This said, it should be emphasized that a biophysical standardized geographic information system is necessary in the implementation of any formal or informal informed decision technique.

To develop a standardized system, it is important for all participating agencies and organizations dealing with forest land to agree on common definitions, assumptions and basic geographic management units. Such an information system should provide at the minimum, site-specific resource capabilities and limitations, biophysical attributes and information about spatial relationships between resources and users. In addition, the system should provide information about uses and capabilities over time.

5.0 DECISION ANALYSIS

5.1 The Value Assumptions of Decision Analysis

Decision analysis presumes that there is a single decision maker or a group chartered to speak on behalf of society. It assumes that the decision makers can fully and consistently articulate their preferences among alternative states of the world. These preferences can be described by a unit called utility. The objective is the maximization of the expected value of utility. The method uses the decision maker's judgments to derive the utility function. In this process, attitudes toward risk and different timing of consequences are also accommodated.

Decision Analysis allows an explicit representation of the preferences of the decision maker, imposing only some plausible requirements of rationality of judgment and permitting the decision maker to identify those consequences that affect the desirability of an alternative. The technique imposes little in terms of the content of what should be desired. Thus, for example, if the decision maker considers "satisfying the demand of group X" to be an important objective, it can be included in the choice process using decision analysis.

5.2 The Decision Analysis Method

There are four basic steps in applying decision analysis. The first step consists of structuring the problem, i.e., determining objectives, identifying alternatives, and defining measures of effectiveness for each objective (attributes). The second step consists of the assessment of the possible consequences of each alternative. This includes quantification in terms of the attributes, timing and uncertainty involved with each alternative. The third stage includes the determination of the preference or value structure. Through a process of questioning the decision maker, it involves the construction of a mathematical function which indicates the ranking of alternative consequence scenarios described by their attributes (this function is called a utility function).

Consider, for example, a decision maker who is interested in only two objectives: employment and forest preservation. The attributes could be defined by the decision maker as percentage of labour force employed and the old-growth trees remaining as percentage of current stock. The utility function allows the analyst to rank alternatives such as (1) an option that ensures preservation of 80% of old-growth forest, while involving a 50% chance of 93% employment rate (or 7% unemployment) and a 50% chance of 95% employment versus (2) an option which will allow a 90% chance of preserving 80% of the old forest and a 10% chance of preserving 70% of the old forest, but creating a higher employment level of 96%, for sure. The process of deriving the utility function involves posing many such choices to the decision maker and inferring (with the aid of assumptions) from the responses the general shape of the function (not an easy task of judgment!).

The fourth step of decision analysis is the evaluation and comparison of the alternatives. This step includes using the utility function to obtain the ranking of all the alternatives considered. Typically the analysis will now include an examination of the choice in terms of its sensitivity to preferences and consequences.

5.3 Evaluation of Decision Analysis

The advantage of decision analysis is that it allows flexibility in terms of objectives, definition and measurement of effectiveness. It allows an expression of subjective preferences among timings of consequences and the degree of uncertainty which is involved. The technique is transparent, the assumptions are minimal, and data bases can be used in conjunction with judgment to ensure comprehensiveness. The technique encourages a systematic approach to problem solving and provides a framework for sensitivity analysis.

The major disadvantage of the technique is that it requires the identification of an "authorized" voice for society and that the spokesperson or persons selected have a consistent preference structure that represents true social preferences. The technique also requires agreement on probabilities and problem structure, since all these are subjective elements. In society there is rarely one individual or organization that is the final arbiter of social preferences, probabilities and appropriate problem structure. The technique's main usefulness, therefore, is to articulate alternative points of view in the decision process in a way which is accessible to other participants in the process. This may lead to a focus in a negotiation process upon the true elements of conflict. Although such focusing and clarification of conflict may facilitate negotiations and agreement, it can also lead to polarization of views.

6.0 COST-BENEFIT ANALYSIS (CBA)

6.1 The Value Assumptions of Cost-Benefit Analysis

Cost-benefit analysis is much more directive with respect to what is desirable. It assumes that the primary social objective is economic efficiency. The desired state is the one which provides the total maximum value of production and consumption opportunities to society given the existing distribution of wealth. This means that the forest land use allocation which provides the highest net benefits in terms of consumption opportunities should be selected. The valuation of costs and benefits is reflected by the willingness of the people in the system to pay for the different quantities of goods and services gained or sacrificed when choosing the best alternative. Where competitive markets for these goods and services exist, the prices from these markets provide the values to be used in the analysis. Where goods and services are not traded in competitive markets, the analyst can use estimates of what market price would have prevailed had a competitive market existed (e.g., finding out what people are willing to pay for different levels of wilderness preservation, or the "shadow price" of employment when the economy is not in full employment).

6.2 The CBA Method

CBA begins by recognizing that scarcity prevails: there is an economic problem in the sense that human wants exceed the resources available to satisfy them. This necessitates hard choices if society's welfare, however defined, is to be maximized. CBA can help in this process of rational decision making.

CBA is a tool designed to determine whether alternative forms of allocation of our scarce resources make society "better off." The objective of CBA is to determine if the net value of the output in the system with the proposed allocation is greater than the net value of the output under all other possible allocations. This allocation of resources is called an efficient allocation.

Maximum allocative efficiency occurs when it is not possible by altering the configuration of inputs and outputs in the economy to make one or more persons better off without also making someone else worse off. This criterion for allocative efficiency leads to the conclusion that if a change in allocation results in an increase in well being for at least one individual and a decrease in well being for none, then there can be no doubt that such a change should take place. Efficient allocation of resources occurs when we choose options with the highest net benefits.

The measurement of benefits and costs is the analytical heart of cost-benefit analysis. The analyst tries to identify and measure that the full range of consequences of policy alternatives for allocative efficiency. This means that tangible and intangible costs and benefits must be considered, that effects years in the future must be taken into account, and that both market and non-market effects must be incorporated into the analysis. In most cases, the specification of "costs" and "benefits" is a matter of the algebraic sign of the consequences: undesirable consequences are called costs and desirable consequences are called benefits.

In general terms, the measurement of benefits and costs has four steps: identification of the types of effects, quantification in physical terms, dating and monetization.

(1) Specifying the Types of Effects: The measurement of benefits and costs begins with the specification of the types of effects or consequences associated with the proposed allocation. It is essential to understand the relationship between the allocation desired and its consequences. A model may be helpful here, but the place to start is by thinking about the intended beneficial consequences and then the wider "ripple" effects.

(2) Quantification in Physical Terms: Each type of positive or negative effect (benefit or cost) must be quantified in consistent physical terms. If, for example, an objective of land allocation is the preservation of diversity, the consequences of a particular scheme must first be described in the simplest terms, for example, by the number of species retained in the system and the changes in species mixes. The quantification stage must also specify the degree of uncertainty associated with the estimated consequences.

(3) Dating the Benefits and Costs: The third step is to specify the timing of the positive or negative consequences since benefits that will not be received for a decade are not as valuable as those to be received this year. The converse is true of costs, of course.

(4) Reduction to a Common Unit Measure--Monetization: To ensure comparability in evaluating consequences of alternative allocations, all consequences must be converted into a common unit. Dollars serve as a convenient, well-understood unit of value and indeed many of the benefits and costs have a financial dimension. A major problem with using dollars, however, is the reluctance of people to monetize values explicitly, even though in daily life they implicitly do so all the time by deciding how much to spend to promote a specific objective. Note that adjustments in the unit of value must be made to correct for differences in timing and for uncertainties associated with the consequences. This is achieved by discounting and adjusting outcome to reflect risk free equivalent values.

Among the conventions of CBA are:

(1) Measure costs and benefits in constant dollars.

(2) Include only real effects, i.e., effects which increase total production and consumption opportunities and ignore distributional consequences. Regional employment creation, for example, should not count as a benefit if the province has full employment.

(3) Except in some special circumstances, ignore indirect benefits to avoid double counting.

(4) Evaluate "intangible" benefits to ensure comprehensive assessment of the total consumption and production opportunities for society--the opportunities which cost-benefit analysis attempts to maximize.

(5) Use "shadow prices" where competitive markets do not exist.

The assessment of non-market values is probably one of the most difficult problems in assessing comprehensively the costs and benefits associated with alternative allocations of forest land among competing uses.

6.3 Ways to Evaluate Non-Timber Values in CBA

There are several ways to evaluate non-timber values of forest uses.

(1) Contingent Valuation Method (CVM)

CVM attempts to simulate market behaviour by asking consumers through a social survey what they would be willing to pay for a good or service. The value of the good is estimated by multiplying the average willingness to pay by the number of consumers.

Advocates of CVM cite a number of advantages. First, CVM is consistent with the theory of individual choice and welfare measurement. Second, CVM is flexible. The technique can be modified to incorporate changes in quality, quantity, alternative payment mechanisms, market structures and types of trade-offs related to most non-market situations. This flexibility is reflected in the wide application of CVM to different types of valuation problems ranging from expenditures on reducing risk to wilderness preservation. Third, CVM can incorporate non-user values such as option and existence values into the valuation. Finally, CVM is relatively inexpensive.

The problems with CVM include: (1) people who respond to hypothetical choice situations may have difficulty in expressing their preferences; (2) people may respond to surveys just to participate in the choice process although they may have no firm or strong opinions; (3) people may try to influence results by misrepresenting their true willingness to pay, since they do not actually have to pay; and (4) people may respond to the questionnaire in a way that may bias the result (i.e., how you ask the question may influence the results). Another dilemma is the fact that people respond to questions about willingness to pay for a benefit differently than they respond to how much compensation they require to give up a benefit they have. The alternatives available to the evaluator are (a) to choose a mid-range estimate or (b) to use willingness to pay when benefits are added and willingness to accept compensation or willingness to sell, when the withdrawal of an existing benefit is contemplated.

The application of CVM also requires consideration of aggregation problems since in answering about willingness-to-pay for a specific non-market benefit one does not consider other benefits which are available or might be available as close substitutes. Thus, for example, if the value of wilderness areas is estimated by adding CVM estimates for each separate wilderness area, the process ignores the fact that consumers may view different wilderness areas as substitutes.

To conclude, there are many problems with CVM, but many of these problems can be corrected by careful survey design and tests of robustness by employing alternative survey designs.

(2) Travel Cost Method (TCM)

The underlying concept of the TCM is simple. Travellers to recreation sites incur measurable travelling costs which can be used to estimate the willingness to pay for the site. A principal advantage of TCM is that the data on site visits necessary for calculating values is usually readily available. Consequently, the technique is relatively inexpensive to use. Second, TCM uses actual consumer expenditures to estimate non-market values.

The problems with this method include: (1) the evaluation of the costs of travel time; (2) visit to a site may be part of a multi-destination trip, and thus the costs and benefits should be allocated among destinations; (3) aggregation problems exist (as in the case of CVM); and (4) the method ignores existence and option values.

(3) Hedonic Price Method

The price of a good is a function of a bundle of attributes. The value of a recreation site, for example, is a function of a number of factors such as distance, facilities, availability of recreation activities, environmental quality and scenic value. The difference in attributes allows for the valuation of specific features by using statistical methods to assess the impact of each individual characteristic. For example, a site with good fishing can be compared to other sites which are similar in all respects other than the availability of good fishing. The difference in price can then be used to estimate the value of fishing.

The principal advantage of the hedonic price method is that it uses actual market data to estimate non-market values. Unfortunately, it also has serious disadvantages. First, it is difficult to control for all the significant variables which affect price. Sufficient market data is often simply not available. Second, there are different formulations of the underlying price relationships which give different results. The actual relationship is usually unknown. Third, it assumes perfectly functioning markets. Consumers, however, may have insufficient information on non-market characteristics to accurately assess site attributes. Finally, expectations of future trends are capitalized into existing prices, making it difficult to isolate the effect of any individual characteristic. For these reasons, the hedonic price method has limited applicability.

(4) Conjoint Measurement (CM)

CM is a technique used by marketers. It combines the idea in hedonic pricing (using revealed choice among goods representing different bundles of attributes) with the survey method of contingent valuation methods (i.e., asking people to choose among or rank hypothetical options). Statistical techniques are used to assess trade-offs among the attributes (and if one attribute is price, one obtains the willingness to pay for different attributes).

This technique has the advantage that it does not require direct monetization of benefits and, therefore, can be used to derive trade-offs without reference to market processes. The shortcomings as well as some advantages of the technique are similar to those inherent in CVM (i.e., using survey technique and hypothetical choices).

6.4 Evaluation of Cost-Benefit Analysis

The major advantage of cost-benefit analysis is the provision of a logical, relatively simple way to reach a choice--an accounting system which balances advantages and disadvantages of each alternative to produce an easy to understand common unit of net benefit (dollars). The validity of this accounting system depends on the extent to which market data reveal the true preferences in society and to what extent it is accepted in society that the market process is the appropriate means of registering social preferences. Cost-benefit analysis is open to evaluation and permits sensitivity analysis. The technique is used extensively in government institutions and is widely accepted. The background studies indicate that it is a viable and effective method for assessing tradeoffs between forestry and non-forestry uses.

The major disadvantages of cost-benefit analysis include a need for expensive information and qualified analysts. The comprehensiveness of this technique depends to a large extent on the degree to which non-market consumption values are incorporated into the analysis. Also, given the uncertainty of various inputs, a wide range of sensitivity assumptions have to be incorporated. This can result in a wide range of final results.

If one does not accept economic efficiency as a primary criterion, the most important disadvantage of cost-benefit analysis as a decision tool is its single focus upon the maximization of total consumption and production opportunities for society given the existing distribution of wealth Other impacts important to decision makers such as employment are not explicitly included.

7.0 MULTIPLE ACCOUNT ANALYSIS (MAA)

7.1 The Value Assumptions of MAA

MAA emerged in response to the desire to incorporate important non-efficiency objectives such as employment and biological diversity into the evaluation. The idea is that in the efficiency domain, cost-benefit accounting can reduce complex arrays of consequences for each alternative to a bottom-line performance measure that can be compared to an array of non-efficiency consequences accounts. The trade offs between the "bottom lines" of these accounts in choosing the best alternative are left to the designated decision maker.

From a philosophical point of view MAA combines a measure of plasticity, thus retaining the sovereignty of the decision maker, while accepting and highlighting the value of economic efficiency. In MAA, for example, concerns for regional unemployment may lead to a choice of alternative forest allocation that is inferior in terms of provincial economic performance, but the costs and benefits of such a choice will be made explicit.

7.2 The Method of MAA

MAA incorporates cost-benefit analysis and supplements it with a multiple account framework to display and compare the effects of undertaking alternative courses of action. Evaluation or trade-off analysis is thus facilitated by allowing the decision maker to consider the alternatives in terms of their contributions to different objectives such as national economic development, environmental quality and social well-being.

The original format of MAA was designed to meet the needs of the water planning authorities in the U.S. (specifically the Water Resource Council - WRC). In this application the following accounts supplemented the cost-benefit analysis or national economic development account.

The Environmental Quality Account (EQ)

The EQ account shows effects on ecological, cultural, and aesthetic attributes of significant natural and cultural resources that cannot be measured in monetary terms. Entries in this account are to be expressed in appropriate numeric and non-numeric terms.

Regional Economic Development Account (RED)

The RED account shows the regional incidence of economic effects, income transfers, and employment effects. This account includes two measures of the effects of the plan on regional economies: regional income and regional employment. Input-output analysis is normally used to evaluate these economic impacts.

The Other Social Effects Account (OSE)

The OSE account shows urban and community impacts and effects on life, health, and safety. This account is expressed in monetary, other numeric or non-numeric terms. The OSE account displays and integrates into the planning process the effects of plan alternatives from perspectives not covered by other accounts.

In 1979, an MAA framework based upon that of the U.S. WRC was recommended for use by the then B.C. Ministry of Lands, Parks and Housing. MAA was seen as a means of incorporating economic, social, and environmental data into the government's planning process to facilitate the allocation of land amongst competing uses.

In this proposed framework, four accounts were used: an efficiency account (the Provincial Income Account) and three non-efficiency accounts (Regional Development, Environmental Impact and Governmental Income and Expenditures). The establishment of such accounts affords decision makers both a more comprehensive understanding of all of the effects of the alternatives and the ability to understand the trade-offs between alternatives.

7.3 **Evaluation of MAA**

MAA has several advantages. First, it does not confine measurements to monetary units and therefore avoids the difficult problem of establishing monetary values for non-market goods and services. It incorporates economic, environmental, and social data in a single decision-making framework and thereby provides decision makers with formation for evaluating the effects of alternatives in terms of their relative contributions to economic, social and environmental objectives. It is adaptable in that it can accommodate any number of account types, and the same framework can be used with more or less emphasis placed on any of the objectives. It also allows the decision maker to use discretion in weighting the objectives. It allows for the consideration of the disparate interests of regional and provincial spatial scales. It is comprehensive because it utilizes the expertise of many disciplines and levels of government. It condenses disparate data in an internally consistent framework so that alternatives can be compared according to their contributions to various objectives.

The limitations of MAA are: It does not result in an explicit decision criterion as does a strict cost-benefit analysis. It only displays the effects of taking alternative courses of action to facilitate trade-off analysis. Judgments on the part of the decision makers are still necessary, but can be formalized in a process similar to the derivation of a utility function in decision analysis. It is complex, time-consuming and expensive. It requires the coordinated effort of a number of disciplines and levels of government and also entails the collection of large amounts of data (some of which may not be readily available). The use of MAA does not eliminate issues posed by cost-benefit analysis such as the choice of discount rate and time frame for analysis and the valuation of intangibles for the National Economic Development Account. It poses further issues for consideration such as which accounts should be included or excluded, and what constitutes environmental quality or social well-being.

8.0 CONCLUSIONS

It is widely agreed that public forest land in B.C. should be allocated so as to maximize the net benefit to society as a whole. This means:

(1) incorporation of social values in the decision process articulated as preferences and trade-offs among conflicting objectives;

(2) the use of the most appropriate data base and technical and scientific know-how to the extent practicable;

(3) the explicit recognition of the role of assumption making and other sources of uncertainty in the analysis and choice process.

Comprehensive multiple account analysis provides a framework of choice that satisfies these criteria. An analytic standardized framework for MAA for forest land allocation among competing uses should incorporate the principles of a biophysical land classification as part of its integrated geographical information system, the methods of decision analysis to structure and define trade offs among accounts to formalize its decision component, and cost-benefit analysis principles to ensure economic allocative efficiency where such an efficiency criterion is appropriate.

To be comprehensive, the framework must consider all advantages and disadvantages associated with an alternative and be able to reduce them to a common unit that reflects social trade-offs among multiple objectives. This means that no important advantage (benefit) or disadvantage (cost) dimensions can be excluded from the analysis as intangible or unquantifiable. Indeed, whenever "trade-offs" are made by society with respect to a benefit or a cost, it is possible to quantify its value in terms of this "trade-off." The willingness-to-pay principle is central to such quantification. If "trade-offs" are not acceptable with respect to some outcomes (e.g., unacceptable environmental risks), such constraints must be identified explicitly and used as screening devices to eliminate alternatives. It is, however, desirable to assess the "costs" of such constraints to society in terms of other objectives.

Given the importance of social values and assumption making in the application of multiple account analysis to the problem of forest land allocation, public participation is necessary. This participation can take the form of:

(1) Surveys of the preferences of the public to establish value units reflecting trade-offs through willingness-to-pay evaluation.

(2) Open public hearings to generate alternatives and inform the public about the process and its outcomes.

(3) The use of advisory committees with representation of a variety of stakeholders to ensure:

    (a) the comprehensive consideration of all value dimensions involved in forest allocation;
    (b) the generation of imaginative forest land allocation options;
    (c) the scrutinization of assumption making; and
    (d) the highlighting of "equity" problems.

To ensure systematic and comprehensive application of MAA for decision making, it is necessary to develop standardized operational guidelines for forest land allocation in B.C. for each account, including specification of assumptions, measurement methods, and analytic procedures (e.g., requirements for sensitivity analysis). Given the expense of using MAA it is important, however, that such guidelines reflect the stakes associated with a decision. In cases where the stakes are low, or agreement on allocation can be reached without much conflict, the analysis should be simplified or preempted using simpler and less expensive methodologies.

9.0 RECOMMENDATIONS

(1) The Province of British Columbia should develop a comprehensive multiple account framework based on the U.S. Water Resources Council accounts system. The framework should identify the accounts and provide guidelines on how the various accounts should be prepared.

(2) To assist in the implementation of a multiple accounts framework, geographical information systems should be integrated with existing growth and yield models and the provincial input output model to provide an integrated model for estimating the impacts of alternative land use decisions. Common guidelines should be used by all agencies involved in data collection to ensure consistency and compatibility of data sets.

THE USE OF ENVIRONMENTAL IMPACT ASSESSMENT IN FOREST PLANNING AND MANAGEMENT

A BACKGROUND PAPER PREPARED FOR
THE BRITISH COLUMBIA FOREST RESOURCES COMMISSION

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EXECUTIVE SUMMARY

The application of Environmental assessment (EA) to forest planning and management is uncommon in Canada; only the Province of Ontario has attempted to formally integrate EA into routine practice. Yet, there is increasing public pressure across Canada to improve management practices and planning techniques so that they afford greater attention to the whole forest environment and not just the standing merchantable timber. Consequently, foresters are being challenged to carry out detailed assessments of plans and activities before any actions are initiated on the ground.

Overall, the challenge is to devise and implement one or more planning and decision making systems that will meet public expectations and, at the same time, still permit profitable industrial operations on Crown forest lands. This is no easy task, and requires a strong and long-term commitment to improvements by governments, industry, and the public. To illustrate some of these difficulties, the basic principles of environmental assessment are outlined, the US and Ontario systems are compared, and conclusions drawn.

Environmental assessment is not a panacea to resolve all problems. It is a process, which if applied carefully, offers better guidance to decision makers in choosing a course (or courses) of action to achieve specific goals. However, environmental assessments, like any other planning processes, do not make the decisions by themselves; decisions are made by people, who are still subject to personal, institutional, and ideological biases.

One means of improving the match between societal expectations and industrial needs, would be to implement broad policy assessments at a provincial scale to examine the context of societally acceptable forest planning and management goals. Having determined what the provincial forest landscape might look like in the future, we can then start devising methods to arrive at this point in the manner and time frame desired. This will provide the context for regional and local activities. Lacking this broader context, it remains difficult for forest planners and managers to mount a coordinated effort towards societally acceptable actions.

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1.0 INTRODUCTION

Environmental Impact Assessment (EIA) has been in existence for about twenty years now, and has found widespread application to many different problems around the world. The literature on the subject is immense, extending to many thousands of journal articles, books, conference proceedings, and the assessment documents themselves, in addition to voluminous quantities of court testimony. Despite twenty years of experience, many problems remain in applying EIA, and the whole field is still evolving, both conceptually and technically. Outstanding problems include matters of process (how EIA is carried out) and technical detail (the scientific aspects involved).

This background paper has been prepared to serve three main purposes. Firstly, it provides an overview of the conceptual underpinnings of EIA, outlining some of the many problems encountered and briefly discussing how some of these have been, or are being addressed. Secondly, the paper briefly examines some of the EIA legislation that has been applied specifically to the problem of planning and managing forests.

Finally, the background paper briefly examines some of the problems that exist in applying EIA to forest planning and management. The bulk of the experience with these problems lies in the United States, although the ongoing Class Environmental Assessment hearings in Ontario, which started in 1988, are generating considerable amounts of debate; some of which may actually be useful later on.

1.1 The Origins of EIA

In 1968, Gilbert White asked:

> Why is it that comprehensive studies of alternatives and the possible significance and character from each alternative have never been carried out? A multiplicity of very human elements accounts for much of this lack of planning. The persons who make the decisions sometimes are actually unaware of the consequences, and only study them after it is too late. This lack of foresight is due only partly to stupidity or ignorance, or a lack of scientific knowledge about certain ecological relationships. Sometimes there is an awareness of the problems, and even preliminary planning to investigate them, but the very complexity and uncertainty of the problems create perceptual distortion, and the hazards are minimised. (quoted in Porter 1988).

Environmental impact assessment (EIA), which originated in the United States, was a response to the need for a comprehensive, and interdisciplinary planning strategy. This need arose from perceptions in the United States, during the late 1960s, that planning studies of the day were not yielding carefully evaluated proposals, sound design criteria, and acceptable solutions. This discontent was clearly manifested in the level of conflict over individual projects or components of these projects (Bacow and Wheeler 1984).

Late in 1969, the United States legislature passed the *National Environmental Policy Act* (NEPA) and thus EIA came into being (Canter 1977; 1984; Hollick 1984). There are many definitions in the literature of what EIA was or now is. Munn (1979) defined EIA as follows:

> Environmental impact assessment is defined as an activity designed to identify and predict the impact on the biogeophysical environment and on man's health and well-being of legislative proposals, policies, programmes, projects, and operational procedures, and to interpret and communicate information about the impacts.

Initially, EIA was little more than an action-forcing mechanism to ensure more consideration of the environment in project planning and decision making.

> It was felt agencies would be unable to ignore the NEPA requirements for addressing environmental goals if they had to produce a public record of the environmental issues and information that were considered along with technical and economic factors in reaching their decisions. [Subsequently, the process became a means of] ...predicting and evaluating the probable environmental effects of a proposal in order to reach a balanced decision between environmental, technical, and economic factors, and to devise acceptable measures for mitigating the more serious environmental effects (Hollick 1984:191).

1.2 Experience With EIA

Because NEPA was a rather vague, general piece of legislation, the significance of its passage into law was unforseen, and NEPA was initially open to broad interpretation; a problem quickly corrected by court rulings. A crucial part of NEPA was its focus, albeit poorly defined, on the assessment of the biophysical and socio-economic aspects associated with any one project.

There have been many mixed feelings about EIA. Rickson et al. (1988) suggest it can be seen as:

i) a government means for deferring a decision

ii) an uncontrollably complex process that obfuscates the planning process

iii) a passing fad that will go away, and

iv) a means of innovation and effective citizen participation in decision making.

All these viewpoints, in addition to the industrial perception of EIA as "costly, time-wasting and self-serving" have some merit (Porter 1988). After twenty years of experience with EIA and its derivatives, such as social impact assessment (SIA), technology impact assessment (TIA), and cumulative impact assessment (CIA), there are many good and bad examples described in the literature (Rosenburg et al. 1981). As will be seen later on, EIA has been abused as a planning method in many cases.

Despite its many failings, EIA can improve any decision making process by providing good information and data throughout the planning, implementation and post project evaluation stages. It can also function as a means of encouraging more equitable participation in the development stages by those people who would be affected or, who have some other interest in one or more stages of the undertaking.[1]

Experience has also revealed that the effective use and application of EIA requires five main principles, which Gibson (1988) elaborated as follows:

> 1) the process must be enshrined in law, and compliance with its requirements and products must be legally enforceable;
>
> 2) the process must apply clearly and automatically to all proponents of projects that may pose environmentally significant effects, so that all such proponents incorporate environmental considerations from the very beginning of project deliberations -- proponents who judge application of the process to be inappropriate may seek exemption, but must consider environmental factors at least to the extent necessary to prepare a persuasive exemption request;
>
> 3) proponents subject to the process must be required to demonstrate that they have examined alternative means of satisfying the project objectives and meeting the public interest, in light of environmental as well as financial and technical considerations;
>
> 4) environmental considerations must be defined broadly, and realistically, to include socio-economic as well as bio-physical effects and their interrelations; and
>
> 5) the process must ensure early and effective public involvement to allow for incorporation of public views and to ensure independent scrutiny.

Overall, EIA has gained credence, and although still developing in technique (Bisset 1980; Conover, Strong, et al. 1985a and 1985b; Shopley and Fuggle 1984) and application (Dickert and Tuttle 1985; Hollick 1981; Wright and Greene 1987), it is now widely used around the world (Hollick 1986; Morgan 1983; Rosenburg, et al. 1981; von Moltke 1984).

EIA has become an accepted methodology in attempting to determine what the outcomes of any particular project or action might be. Note however, that much of the EIA literature and practice has been derived from the project-specific level. The use of EIA at the sectoral level, such as forestry or mining, is far less common, and consequently less well refined. The success or failure of EIA as a concept, and in its application to real problems, will undoubtedly be debated in perpetuity.

1.3 EIA as a Planning and Decision-Making Tool

Environmental impact assessment provides a mechanism for evaluating the environmental impacts of a project in a logical manner which can aid the decision making process (Clark 1984). But, EIA is not just a well defined planning methodology, based on accepted scientific techniques.[2] It is also a mechanism by which society in general can play a role in helping to define the acceptability of projects. Beanlands and Duinker (1983) noted the difficulty in assessing everything in any one undertaking, and suggested that a better approach would be to assess the most important aspects, which they termed "valued ecosystem components."

Effective EIA incorporates the societal assessment of these valued ecosystem components and uses them to guide the design and impact analysis process. It is also important to ensure that the right criteria are selected as a means of evaluating the significance of changes that might occur with or without the undertaking, and as a means of evaluating the important linkages between impacts and the valued ecosystem components. The use of expert panels and peer review committees have been advocated to assist in this process (Beanlands and Duinker 1983; Beanlands 1985).

EIA can serve as a means of bringing together many different disciplines in a way which fosters interdisciplinary research and innovative solutions.[3] In situations where EIA has been applied as a means of reducing uncertainty and resolving conflicts, translating an interdisciplinary approach into an effective and workable solution, may introduce additional frustrations for planners, proponents and the public; in some cases this may escalate the level of conflict and debate. However, with careful planning, this heightened level of discussion can be used as feedback to introduce improvements in many stages of the assessment. For example, in refining the need for the undertaking, defining the spatial and temporal boundaries, and designing detailed project assessment criteria.

Clearly, many of the techniques used in EIA procedures are also commonly used by planners in their routine activities; for example inventorying, assessment, monitoring and review.[4] What makes EIA different from a routine planning exercise is its ability to integrate many different techniques and disciplines into a cohesive, well structured planning exercise that has well defined boundaries and a scientifically valid method of analysis. Not all EIAs have succeeded in achieving these goals (Rosenburg et al. 1981). Brown (1986:15) noted:

> ...environmental impact assessment implies the ability to predict the response of an ecosystem to artificial perturbations that exceed the range of natural changes. In reality, most current environmental impact statements are entirely subjective estimations by "ecologists" of variable training and expertise, based on information of varying quality and relevance.

A successful EIA will attempt to integrate techniques and disciplines; it will develop a specific focus with well defined goals and objectives, and will be undertaken with clear consideration about how the results will be integrated with other programmes and the needs of society. Thus, EIA can provide a "public record of the factors and data considered and the evaluation methods used by the agency in arriving at its decision" (Hollick 1986:159).

EIA can also provide useful insights into previously unexplored areas of doubt, and the solutions or design improvements derived may then be applicable by themselves, as separate components, in more routine environmental planning situations. As a result, planners then have an opportunity for innovative problem solving (Forester 1980).

Impact assessment processes are typically independent of routine planning efforts, but many of the principles of EIA could, and indeed should, form an integral part of all resource planning and management processes. In this way, the evolution and refinement of planning can be usefully fed back into the overall goals of improving resource management while at the same time ensuring that environmental quality is maintained.

However, no EIA process, no matter how good, is a substitute for the political decision-making process. EIA is a scientific and legal means to enhance the decision-making process, but it does not replace it. Twenty years after the introduction of NEPA and the mandatory requirement for EIA, the decision-making process is still influenced by political realities and not just the facts presented in the EIA.[5]

Political processes involve the use of political power, which is the ability to decide who will or will not have power. Thus, a political decision-making process will also be one which determines "...who does what to whom with what effect (Hollick 1981:69). And, as with other planning methods, the question of who has access to the information generated during an assessment process, and how that information is to be used (or not) remains a key part of overall political influence.

EIA has been abused as a planning process, especially when the legislation that required an EIA also granted the necessary permits. In these cases, carrying out an EIA became a necessary evil on the way to securing project approval (Clark 1984, O'Riordan 1982; Park 1982) and brought with it no incentive to continue assessment of environmental effects once the project was underway. EIA documents prepared solely to secure project approval miss a part of the reason for invoking EIA in the first place.

It is important to recognise that no matter how good the "facts" are about potential impacts, some decision making is often carried out by non-technical people, who are influenced by an entirely different set of parameters from the scientists and technical experts in the field. All the people involved will have their own set of political values, which will influence the way in which they perceive the substance of any EIA. Enk (1980) noted that many decision makers were still using the EIA process as a means of justifying projects or, more mundanely, as a means of meeting a legislative requirement that they did not understand.

In some cases the abuse of the EIA process is a reflection of institutional inertia (Enk 1980), or perhaps the perception that interdisciplinary research and planning will diminish agency power and influence with the political decision makers (Boschken 1982; O'Toole 1988). Considerable debate remains about how this might be overcome.

Because EIA is now predicated on the use of "scientifically" derived information as a means of making decisions, it seems reasonable to expect that both the information and the context of its use should be carefully matched. Beanlands and Duinker (1983) found that this was not so. In many cases there was insufficient guidance for the scientists to know how "scientific" they should be in order to meet the administrative and institutional needs of the decision makers. Bisset (1980) also noted that the use of science in EIA must be constantly set in the context of the political decision-making processes which has a very different set of constraints.

> It is considered that deleterious projects have been altered or stopped because of litigation and public pressure, not because the contents of particular EISs directed agency personnel to the "correct" decision. Should EISs become more scientifically accurate, certain options for influencing agency behaviour through court action might be closed.[6]

An adequate EIS is more difficult to challenge in the courts (Bisset 1980:41), although the notion of what constitutes an "adequate" EIA will probably never be resolved.

Dorney (1985; 1989) noted that the failure to consider EIA as a part of the larger planning (and political) process, could conceivably create major problems, particularly in cases where project approvals were delayed at unreasonable cost for no justifiable reason. A build-up of project delays and costs could mean the EIA became a large part of the problem, rather than the solution. Similar thoughts are echoed by Rickson et al. (1988) in the Australian context.

The political ramifications of this problem are typically found to be a weakening of the enforcement and legal mandates as governments attempt to appease the development sector. This is particularly problematic during economic slumps where the urge to create employment at any cost may outweigh sound project design and process criteria.

Advocates of EIA often regard it as means of gaining the ultimate answers. In reality we can never have perfect knowledge about all things. There will never be sufficient resources to assess all the potential options and effects, so efficient assessment is important. Such efficiency should strive to avoid unnecessary costs and delays while at the same time focusing attention on the issues and data that are of greatest significance.[7]

2.0 USING ENVIRONMENTAL IMPACT ASSESSMENT

In theory at least, EIA can be applied at two levels. Firstly, it can be (and in many jurisdictions regularly is) applied to site-specific projects and practices. Secondly, EIA could be (but rarely is) applied at the policy level as an assessment of programme goals and objectives, and the effects and alternatives possible within this broader policy framework. In either application, the use of EIA as a means of enhancing the decision-making process, and of developing more environmentally sensitive planning, remains controversial.[8]

2.1 The Successes and Failures of EIA

In any dispute over project design or planning process, the distribution of power is one of the crucial factors in determining where incentives lie for the actors involved to negotiate a settlement. Rickson et al. (1988) suggested that the early stages of NEPA in the United States were a government ploy to be seen to be responding to environmental groups without actually having to make any real changes. Since then, the ability to sue proponents and regulatory agencies for legislative non-compliance or non-performance has become a deterrent against either form of failure.

The incessant use of the courts as a means to test the limits of the law has resulted in huge costs for proponents[9] and is seen by some decision makers as an important failing of EIA. As a result, the use of legislated EIA as an "action-forcing" mechanism has been avoided in some countries because litigated EIA is costly, time consuming, wasteful of human resources, and may eventually yield no better answers than non-EIA processes.

However, avoiding a legislated enforcement mechanism may also be a dubious strategy. It assumes that the will to honour the spirit and legal obligations of EIA, in the absence of a legally binding enforcement mechanism, will be freely available. In reality, there are many examples of EIA attempts that have failed to meet both the spirit and the legal obligations.[10] What makes the United States unique, is its provision of a broadly based mechanism in law, by which correction and legally mandated refinement of these deficiencies can be attempted.

Fairfax (1978) has argued that the EIA process has been unsuccessful in the United States despite this legal option, because it has burdened the environmental opposition with documents to analyse, rather than allowing them to challenge and redefine the mandates and powers of the agencies. Bacow (1980:110) noted that:

> Ten years later [after the passage of NEPA]... We can't say whether NEPA has produced better decisions because we lack normative criteria for evaluating outcomes.

Wilson (1980:196) disagreed, and noted that despite some remaining problems,

> ...the U.S. National Environmental Policy Act of 1969 succeeded in increasing the environmental awareness of federal agencies and has greatly improved the environmental soundness of the decision-making process...

Rosenburg et al. (1981:592) noted that the failures of EIA included:

> ...tokenism, unrealistic time constraints, uncertainty of program or development schedules, difficult access to e.i.a. literature, questionable ethics, lack of coordination among studies, and poor research design.

However, they also felt that the successes of EIA, although outweighed by the failures, included,

> ...increased environmental awareness due to public involvement in e.i.a., some environmental protection, and elucidation of intriguing research problems.

2.2 The Process of EIA

The essential ingredients of Munn's (1979) definition of EIA include the following concepts:

- identification and prediction of impacts; and
- interpretation and communication of the information about these impacts.

The literature on EIA has used the terminology surrounding "impact" in several ways. Munn (1979:1) suggests that the terms change, effect and impact should be qualified as follows.

- "Change" can be natural and/or man-induced;
- "Effects" are man-induced changes; and
- "Impacts" connote a value judgement about the significance of the change, regardless of what caused it.

In addition, changes, effects and impacts can be beneficial or harmful. It is not unusual for there to be heated debate about the concept of benefit and harm, and the whole issue of value judgements and subjective versus objective interpretation plays an extremely important role in many assessment decisions (Ghiselin 1982).

In its simplest form, EIA attempts to lay out what will happen to the environment in which we live, if a project is put into action (identification and prediction). EIA thus describes the present state of these environmental variables (the environment likely to be affected) and then attempts to predict what changes will result that can be directly attributed to this specific project (the environmental effects).

Following the determination of these two factors, a decision is made either to proceed with or without modifications, or to stop the project (interpretation and communication). Decisions can also include requirements for certain additional project design details (mitigation of effects) or for rejection pending more convincing evidence of less detrimental environmental effects.

EIA becomes controversial when we attempt to use our rather imperfect understanding of nature, and by extension environmental effects, to say either the project or activity is environmentally benign, or it is not. Several crucial stages are involved.

2.2.1 Scoping

The first stage in the EIA process is to clearly define the problem. What is to be studied, how and why? There are several sets of boundaries that can be placed around the problem, including administrative, project, technical, and ecological.[11] All of these boundaries have time and space constraints that play an important role throughout the duration of the assessment. Once the nature of the problem is defined, responsibility for action has to be decided.

Which government agencies will be involved, and which agency has the primary responsibility? (the lead agency in US parlance). How will the assessment be scheduled, who will pay for it, and is there a budget to continue the work over the several years that may be needed? What form of public involvement will be adopted, how will specific issues be analysed, by whom and under what guidelines?

All of these factors must be carefully laid out and evaluated at the start of the process, so that the "range of actions, alternatives and impacts to be addressed ... are delimited from all possible actions, alternatives and impacts" (Canter 1984:17).

Scoping is a very critical stage[12] because it determines what will or will not be examined. The scope of what can or cannot be included is also restricted by the extent of the legal mandate. A further vitally important issue in the scoping process is how value judgements are utilised. This will determine the manner in which agencies will perceive how they think they should be acting, and Susskind (1983) has advocated the use of negotiation and mediation techniques to decide these administrative issues.

The United States Forest Service (1983) stated

> Effective scoping identifies and focuses attention on important matters early in an environmental analysis and results in:

- informed decisions;
- cost effective analysis and decision making;
- increased credibility;
- fewer appeals and lawsuits.

Once the problem and the administrative setting have been defined, the techniques to be used in the EIA can then be examined.

2.2.2 Baseline Data

Detection of change presupposes knowledge of the existing state of affairs. Yet, our knowledge of many matters ranges from adequate to poor. This is particularly problematical in forest ecosystems, most of which involve complex interrelationships between variables which are themselves only partially understood. Even after the ecologist has elaborated the functional relationships of ecosystem components, this knowledge may be insufficient to make reliable predictions. The use of science as a means of demonstrating causality has often been abused.

Science is not always exact and deterministic, and the interpretation of results will not necessarily provide the answers sought. Often, the elaboration of one set of details will raise many additional questions about other details, some of which will not fit into the previously determined schema of events. Uncertainty in science is common, and presents problems for those that believe reductionism will reveal a state of perfect knowledge.

Kimmins (1987) points out that

> ...as a science, ecology is amoral. It makes no moral or value judgements about the desirability or lack of desirability of any ecological condition or event. It merely describes the ecological characteristics or consequences of things. Judgements as to whether the characteristics of a particular ecosystem or ecosystem condition are any better or worse than those of any other ecosystem or condition must be made by society. Similarly, judgements as to whether the ecological consequences of particular events are good or bad, desirable or undesirable, can only be made using the prevailing measures of socioeconomic value (Kimmins 1987:24).

If we do not know what the present state of the environment is, how can we identify the changes likely to occur? Duinker (1989) suggested that it is virtually impossible to undertake realistic studies on a large scale in most ecosystems, simply because the very act of intervention changes the system. Without an identical undisturbed system for comparison, we can never know what happened without the disturbance, hence, realistic comparisons cannot be made.

The usual response has been to establish a baseline of information which documents the existing state prior to disturbance. In its crudest form, baseline data is little more than an inventory of existing conditions, as documented in one short time period. There are problems with baseline data compiled in this manner,[13] not the least of which is knowing whether or not the data accurately reflect the inevitable background variability inherent in all ecosystem components.

For example, if a population of animals is being sampled to determine their numbers, health, location and habitat needs, how can this information be gained and is it reliable? Can we be sure that the sampling scheme used actually represents today's reality? Can the results of this sample be extrapolated back to determine past populations? Will this extrapolation be defensible as a means of showing the variability (increases or decreases) in population numbers? Are there other factors at work, that will affect the results? Are these other factors included in the scope of the EIA?

From this short list of questions it should be apparent that such matters are not easily answered. Early attempts at EIA often used what Hilborn and Walters (1981) called "helicopter ecology"; that is, a quick helicopter flight over the area likely to be affected, counting whatever happened to be there, and using the results as the baseline for impact assessment. Obviously, such simple techniques do little more than show what was there on that day, and may be insufficient as a means of predicting potential change.

However, gathering long-term data may also be insufficient, because nobody knows for sure how far back such data should go to determine the natural variability inherent in the ecosystem. And, eventually, even long-term information may become invalid, because the other variables prevailing, such as climatic and anthropogenic influences, will also have changed over time. Hence, the past cannot be simply compared to the present, far less the future. Hilborn and Walters (1981) concluded that baseline studies do not always provide the correct data needs for EIA because:

- it is unlikely that the natural disturbances seen will be the same as the anthropogenic disturbances being proposed;
- it takes too long to gather sufficient data to verify natural disturbances;
- we cannot usually separate the causal factors inherent in natural variation; and,
- it is difficult to know which variables to measure before changes happen.

The alternative to gathering large amounts of baseline data, is to try and mimic disturbances on a smaller scale. This approach can involve laboratory experiments, modelling or, scaled down field experiments. Hilborn and Walters (1981) refer to this approach as "process studies." The underlying philosophy is that an understanding of the essential component processes on a small scale will allow extrapolation to the larger spatial scale of reality in the field.

Process studies have weaknesses too. Even if we can identify all of the processes and interactions involved, how will we choose which ones to study? Hilborn and Walters (1981) suggest that, in reality, it is the politics of science that make this choice, by deciding which research gets funded and which does not. A second problem arises because the variables prevailing at the smaller scale are rarely the same in the larger scale and hence the extrapolation may be invalid.

Several detailed studies have been carried out to better understand cause and effect linkages within ecosystems. For example, on Vancouver Island, British Columbia, the Carnation Creek study which started in 1970, is trying to ascertain what the effects of logging might be on stream ecology and fish populations (Hartman 1982; Hilborn and Walters 1981). Early results have suggested that some degree of stream disturbance due to logging may actually enhance survival of juvenile salmon, which contradicts the more normal proposition that any logging across streams causes excessive siltation and destruction of spawning habitats. The difficulty arises in knowing whether these results can be extrapolated to the larger scale. In the absence of field trials at the larger scale, such questions remain unanswered.

Hilborn and Walters (1981) concluded that the use of baseline studies and process studies have a role to play in EIA work, but only if they were more scientifically controlled, and included much better documentation of experimental technique, and how experience has been gained, including the failures that have been encountered. The notion of monitoring success and failure at the project specific level will be discussed in more detail later on.

2.2.3 The Question of "Significance"

It is clearly not possible or feasible to document every individual environmental effect in any one project. Recognising the limitations of time and money, most EIA requirements stipulate that only "significant" environmental effects should be analysed in great detail. This approach may be pragmatic at the policy level, but for the person undertaking the EIA, how is "significance" determined? For the decision maker at a senior government level, the political ramifications of a decision may be much more "significant" than any detailed knowledge of the actual environmental effects. However, since the basic premise of EIA is to identify and predict environmental effects, the determination of what should and should not be studied, is clearly important.

Duinker and Beanlands (1986) evaluated a number of EIA documents and found that the terms "significantly affecting", "significant impacts", "significantly altered" were used in many different documents in a vague and uninformative manner. They quote several attempts at a definition of significance, including:

- An impact is significant if it results in a change that is measurable in a statistically sound sampling program and if it persists, or is expected to persist, more than several years at the population, community or ecosystem level.
- A significant adverse impact on a biological system can be operationally defined as an adverse impact which justifies rejection of a project or a change in its site, design, or mode of operation
- A significant impact is one where anticipated future conditions, environmental or social, resulting from a proposed action differ from those otherwise expected from normal change, and where this anticipation raises serious concerns among a professional or lay section of the Canadian public (Duinker and Beanlands 1986:4)

Having analysed these attempts at definition in a series of workshops, they concluded that there were four areas of concern within the concept of "significance". These were, a statistical perspective, an ecological perspective, a social perspective, and a project perspective. Taken together, it was felt that a new definition of "significance" could then be proposed.

> Any exercise in judging the significance of an environmental impact should thoroughly consider (a) the importance of the environmental attribute in question to project decision makers, (b) the distribution of change in time and space, (c) the magnitude of change, and (d) the reliability with which change has been predicted or measured (Duinker and Beanlands 1986:7).

The last definition proposed is interesting in its explicit recognition of the need to focus efforts on matters that are important to the decision maker. Normally, if democracy is working reasonably well, one might expect that at least some of the public's concerns will also be those of the decision-maker. This does not preclude the use of lobbying from special interest groups, or the selection of attributes that scientists consider essential to the EIA process.

2.2.4 Prediction and Mitigation of Effects

Having identified the environmental effects, and determined which ones are significant enough to warrant further study, the EIA process then calls for a prediction or forecast to be made about how large or small these effects will be; that is will the magnitude of change be "significant" in the sense of scale and time? The effects that are considered of significance may then need additional work and study, to determine how their extent and duration can be mitigated to an acceptable level;[14]

Beanlands and Duinker (1983:19) defined prediction as "an assertion based on calculation, knowledge, or shrewd inference from facts or experience, in advance of proof" and further noted that "...a prediction or forecast is incomplete without an explanation of the basis upon which it was made."

Significance at this level connotes an effect that may be large enough to pass a previously defined threshold for decision making. For example, if there are previously defined standards for stream sedimentation, which predictions suggest will be exceeded as a result of the project, a decision can be made a) to try and mitigate the cause of the effects so that they will not exceed the standards; b) the standards can be relaxed to accommodate the anticipated effects or, c) the entire project may have to be either cancelled or redesigned to avoid the effects in the first place. A final option, less acceptable these days, would be to deliberately understate the predicted effects and ignore the standards.

There are a number of technical difficulties in making predictions, including the problems discussed above, of not knowing enough about the present situation, let alone the future. This introduces additional uncertainty into the decision making and project design process, since the likelihood of the predictions actually taking place plays a large role in knowing how much time and money to spend on mitigation problems. This in turn has a direct effect on the public and political perceptions of project acceptability.

Jones and Greig (1985:21) suggested that:

> A common feature of all environmental impact assessments is that they are doomed to failure. Failure, that is, in the sense that our hopes of accurately predicting all the impacts of an action that impinges on the environment are virtually nil.

Moreover, they noted the importance of recognising the realistic limitations of the EIA process, and particularly the consequences of incorrect predictions based on inadequate knowledge and understanding. Duinker and Baskerville (1986) noted that EIAs have been generally deficient in quantifying predictions, preferring instead to use vague, qualitative descriptions which are of no use at a later stage in the process. Similar criticisms were made by Beanlands and Duinker (1983), Erickson (1979) and Ward (1978). Duinker (1985:116) noted that biological impact forecasting had been much worse than physical impact forecasting and suggested that most EIAs which contained the former, lacked:

- specification of the variables and units forecast;
- magnitude of the change expected;
- spatial and temporal distribution of the change;
- disclosure of the scientific knowledge base and logic underlying the forecast; and
- quantification of the likelihood of impact.

Duinker (1985) also suggested there are four stages to developing a prediction of environmental effects. First of all the decision maker must decide:

- the range of options needed for the project;
- the components of the environment which are to be predicted;
- the terms (or variables) in which the predictions are to be made;
- the goals or threshold values that already exist or are needed;
- the temporal and spatial boundaries of the project and the level of resolution; and,
- the confidence limits that will be acceptable for decision making.

Once these factors are determined predictions are developed, and within the limits of time, money and manpower, they are tested for validity. The third stage is to inform the decision maker of the predictions and explain their strengths and weaknesses. Finally, the predictions should be compared with the observable effects resulting from implementation of the project. This last stage is often overlooked.

There are many methods available to facilitate the development of predictions, most of which rely on modelling processes. The complexity of the model will depend on the amount of data available and the nature of the effects to be predicted. The latter point is important when striving to overcome the lack of quantifiable statements in EIA documents.

Despite the advances being made in ecology and modelling, some variables, particularly the social, legal and political ones, will continue to defy simple quantification (Hollick 1981; Hyman and Stiftel 1988). As a result, many predictions will continue to exhibit bias and subjectivity. This is unavoidable, because it is usually the person developing the prediction who chooses which techniques to use, and how to apply them. Each method will have its own particular strengths and weaknesses.

Perhaps the best that can be hoped for, is a more explicit recognition of the assumptions used in making the predictions, and the nature of the trade offs-that might be made (Bacow 1980; Hollick 1981). Even so, this greater level of detail will often be beyond the understanding and interest of the decision maker and the layperson.

It is often assumed that successful predictions of discrete environmental effects can be made in isolation of each other. In practice this rarely happens. The variables studied and used for prediction may act together synergistically or additively to produce secondary effects, and they may also interact with other external variables once the project is underway. In addition to these problems, it is important to consider what the cumulative impacts of the project might be.

2.2.5 Implementation and Monitoring

The discussion so far has focused on the specific aspects of EIA that might be included at the project design stage. Remember, that EIA originated as a means of institutionalising a more detailed consideration of the environment likely to be affected, the environmental effects predicted to be caused by any one project, and elaboration of both factors for a range of alternatives. Over the past twenty years the methods needed to refine these aspects of EIA have advanced in both theory and practice.

Early EIA submissions tended to document anything and everything in an attempt to cover all the possibilities. Experience has proved that much of these data are never used, either during the assessment or after the project has been implemented. Hence, the massive amounts of environmental data gathered in the past two decades have often found only transitory use as a means of securing approval, and the opportunity to see whether the predictions made actually came true, has generally been neglected.

Project monitoring, like cumulative impact assessment, is only recently gaining more attention in the literature (Duinker 1989; Krawetz, MacDonald and Nichols 1987; Munro, Bryant and Matte-Baker 1986) and in practice. There are two basic factors to monitor in EIA: compliance monitoring, which makes sure that the project meets the specifications of the approved EIA and the stipulations used to gain approval and permits, and effects monitoring, which attempts to assess how accurate the EIA predictions of effects actually were once the effects have occurred.

Compliance monitoring ought to be relatively simple. It requires a commitment to maintain a vigilant watch during and after implementation of the project or activity, and ensure that deviations away from the regulations or, project approval and permit conditions are quickly remedied. Effects monitoring is more complicated.

As noted earlier, in the discussions on scoping, significance, and predictions, the scope of the programme proposed, choice of variables selected at the start of the assessment, and the manner in which these are used to perform the assessment are crucial. This is particularly true when monitoring project effects because incorrect selection of variables, and inadequate definition of techniques may preclude effective monitoring after the project is underway or completed.

The scientific methods of monitoring, like those of predicting and assessing impacts in advance of their occurrence, are still evolving in response to the challenges now being faced. In the context of forest planning and management, reporting on compliance and effects monitoring is an additional important step. The mechanism by which the results of monitoring are reported serve as a means of elaborating on the results of past activities in order to provide useful feedback and hence adaptation of policy and planning for the future.

Two relatively recent innovations merit further attention in this regard.

2.3 Environmental Audits and State of the Environment Reports.

Since the introduction of EIA under NEPA in 1970, there have been literally thousands of EIA documents. Schindler (1976) noted the plethora of reports and considered that many were a "boondoggle". Fairfax (1978) considered many of the documents to be unduly long on vagueness and short on substance, a problem subsequently reiterated by Beanlands and Duinker (1983). One of the reasons for the poor quality of the EIA documents is a lack of follow up after the project is underway or completed. If no effort is made to see how well the EIA actually compares to reality, no lessons can be learned.

Yet, the increasing emphasis on environmental quality and environmental management, which Munro (1986) and Munro, Bryant and Matte-Baker (1986) indicated is gaining prominence in North America, suggests the need to use the EIA information - gained for approval - more effectively in monitoring. Only when the prediction models have been validated or invalidated, can experience be fed back into the EIA system and into environmental management generally, to yield improvements.

There are however, several impediments to effective monitoring, not the least of which, is the fear of knowing the unknown.

> ...because of conflicting interests over what are really the most valued ecosystems components,

> and the fact that debates on these issues are often highly public and involve strong commitments of people to particular positions, it often turns out that many participants have a vested interest in not knowing the answers and in keeping the debate at a high level of heat and ignorance. Any person who is strongly identified with a particular position, particularly when that position has resulted in the allocation of considerable resources to the outcome advocated by that position, has a strong vested interest in not finding out if that position is incorrect. Shortage of critical information is the best way to guard the sanctity of strongly held views, and this is as likely to be true for persons on the environmental side as on the development side of disputes. ...ignorance has a very large constituency. (Orians 1986:5).

Institutional inertia, interagency rivalries, intense competition for a limited amount of research funding, and the need to stay on the right side of the politically oriented decision makers, add to the problems of post-project monitoring. The harsh reality is that nobody wants to admit to spending thousands of dollars on an EIA and then finding out it was wrong, yet this is precisely the sort of analysis now needed if EIA is to move forward.

To overcome some of these problems, two techniques merit more attention. The Environmental Audit is, as the term suggests, derived from accounting practice, and attempts to review past practices with a view to seeing how effective they have been in meeting management and compliance goals. The State of the Environment Report (SOER) is a compilation and analysis of data relevant to the particular environment being scrutinised. It provides a "snapshot" of environmental conditions and knowledge at one point in time (Elkin 1987a). Both techniques could be usefully adapted to the needs of the forestry sector, and are already becoming institutionalised in a number of political jurisdictions.[15]

2.3.1 The Environmental Audit.

Auditing is carried out in the EIA context to assess two aspects. Firstly, was the EIA process effective (however this is defined), and was there compliance with the process? If so, was it adequate? Secondly, did the actual effects described in the EIA materialise as expected (were the predictions correct?), and were the mitigation measures implemented effective in mitigating the effects anticipated?

Murphy and Stern (1982) suggested that environmental audits should be continuously carried out by any industry to ensure that regulatory compliance is carefully assessed, and adjustments made, before a serious problem can develop. In many industrial operations, where the penalty for non-compliance is high, the environmental audit is a particularly useful mechanism for avoiding punitive damages. There is a second role for environmental audits which can be of equal benefit to both industry and government agencies alike. Auditing can be used to demonstrate effectiveness, achievement (or non-achievement) of predetermined goals, and feedback of this information to the policy and planning levels of management.

Munro, Bryant and Matte-Baker (1987) suggested that the future success of EIA depended on our ability to better monitor the results of past projects and modify decision making in the future. They examined several terms within the concept of auditing, including comprehensive environmental audits and post-development audits. The comprehensive environmental audit lists and verifies the effects of a project (collating the results of the monitoring exercise, or post-development audit). The results are then analysed to see how they compare to the effects that were initially predicted.

In this manner, the content of the audit is both the substance of the project and the process that was used in designing and implementing the project. By comparing the results of the objectives with those actually achieved, the initial mechanisms for planning and prediction can be refined, policies can be adapted and new ideas can be tried, in an attempt to bring the results closer to what was initially desired. There are of course many difficult problems to surmount in the auditing process.

It is essential that the variables to be monitored are carefully established at the start of the project, and these variables should be clearly defined in the EIA document. The project should be implemented as planned, and if major deviations from the plan have to be made, these should be carefully documented at the time, so that subsequent monitoring can take account of them.

Finally, the commitment to carry out post-project monitoring and a comprehensive environmental audit, and evaluation of these, must be honoured.

All too often the final stages of a project are given only cursory attention and, as a result, little or no progress is made. Since the purpose of the environmental audit is to learn from experience, it is essential that the analysis and evaluation be as value free as is possible. This is not easily achieved, and is made more difficult when the nature of the project is politically sensitive, especially if the results show a large discrepancy from the predictions.

In Canada, there are no examples of a comprehensive environmental audit of forest planning and management, although the Baskerville audit (1986c) of the Ontario Ministry of Natural Resources was a large step in this direction. The nearest mechanism tried in recent years, are the several Task Forces and Royal Commissions which have each reviewed specific aspects of forestry. For example the Pearse Commission in British Columbia (Pearse 1976); The Armson study in Ontario (Armson 1976); The Royal Commission on Forestry in Nova Scotia (Connor 1984); The Royal Commission on Forest Protection and Management in Newfoundland (Poole 1981); and the Report of the Forest Resources Study in New Brunswick (Tweeddale 1974).

Ontario has used an audit twice in recent years, both of them being specifically directed at assessing the performance of the Ministry of Natural Resources, fiscally (Archer 1985) and administratively (Baskerville 1986). Auditing forestry in Canada is difficult because there are very few objectives stated in the form of measurable targets within the provincial legislation across the country. This problem was singled out by Baskerville (1986c:51) in his audit of the Ontario Ministry of Natural Resources. "The resource management objectives are so broad, and inexplicit in their use of principles, they are ineffective as real guides to management design."

In the forestry context (and in several other large scale projects) the monitoring process is complicated by the long time lags between implementing the project and being able to see the results. Even if we assume the next crop of trees will be harvestable in fifty years time, the results of today's treatments to achieve the goals desired, may not be visible enough for assessment for twenty or thirty years. And even then, the results may still be dubious.

There are some monitoring aspects that are now carried out more often in forestry. For example, survival surveys attempt to see how well planting has succeeded in regenerating a new forest. A few years later, a "free to grow" survey might be carried out to see how many trees are now established and have a chance of becoming merchantable logs.

These surveys are becoming more common as a result of the ever increasing responsibilities being assigned to tenure holders. Because payment for work carried out is now being tied to performance, such surveys are taking on more significance.

There is a considerable amount of work to be done in setting up the parameters to be audited in forestry and even more to actually implement a useful and usable comprehensive environmental audit. Krawetz, MacDonald and Nichols (1987) have laid out a conceptual framework for monitoring project impacts, which includes selection of monitoring variables, prediction, monitoring, auditing and evaluation methods. It should be possible to adapt these concepts to the forestry context. Baskerville (1986a) has noted that the state of the art in forestry is advanced enough to move beyond the usual, nondescript phrases currently in vogue in most forest management plans, and actually state clearly defined goals which can be assessed at a later time.

If these auditing concepts were accepted and a programme was actually established, it might help to alleviate some of the conflicts now encountered, because all stakeholders would have a better sense of what is actually happening to our forests. This information would be a useful enhancement in land allocation decisions, and it is vital in helping to assess the long-term sustainability of the forest sector, which relies on decisions based on credible inventories and forecasts of growth rates for future harvests.

One way in which this comprehensive environmental audit might be achieved is by use of the concepts underpinning state of the environment reports.

2.3.2 State of the Environment Reports

State of the Environment Reports are a relatively new concept in Canada, although state of the environment reports (SOER) are conceptually quite advanced in other parts of the world. Only a few Canadian examples are available for reference (Environment Canada 1986; Elkin 1987a and 1987b). The common thread in these documents is the emphasis on assembling data about the environment in one document, such that the reader may gain a clearer picture about the present "state of the environment". From this aggregation of environmental data, planners, policy, and decision makers should be able to better assess the results of past actions, at any one point in time. The published document satisfies, to a greater or lesser extent, the public's right to know how their environment is faring, and it allows documented consequences to be accounted for in subsequent activity.

The SOER is similar to the comprehensive environmental audit outlined above, but it goes further, by taking several sectors of activity, and providing not only a detailed analysis for each one, but also an integrated analysis of the individual components working together (Elkin 1987a). It is this reaggregation of analysis that is of particular interest here. Conceptually, a SOER can be applied at several levels of activity, and there are already Canadian examples of SOERs at the National level (Environment Canada 1986) and the Municipal level (Elkin 1987b). The province of Manitoba has recently introduced legislation requiring a provincial SOER every five years. Although it has not yet been tried, there seems to be no reason why the concept of the SOER could not be modified to produce of State of the Resource Report for an individual sector such as forestry.

The function of such a report would be to document the current condition of any one resource, providing data on what has been achieved over say, the past five years, what will be attempted (and why) over the next five years, and to identify how the exploitation of this resource has been integrated with other resource values. In the forestry context, British Columbia has made a significant step in this direction with the legislated requirement for a "Forest and Range Resource Analysis." Two of these documents have been produced so far, the last one in 1984 (Ministry of Forests 1984).

The significance of a comprehensive environmental audit and the broader SOER lies in their potential ability to establish some acceptable "facts" about any one resource. The forest and range resource analysis of British Columbia, gives some indication of how the forest is being managed. It is less important that the exact extent of any one problem is agreed upon. The fact that a problem is seen to be worthy of attention and remedial action is initiated is the real issue here. In subsequent iterations of the analysis, progress or lack of progress can be demonstrated as the problem is better understood. The provision of data that are credible and current, is important and decisions must be based on the best data available. If the data are lacking, or of dubious quality, then the public has a reason to dispute the subsequent decisions. The availability of better data permits validation or invalidation of past decisions; both allow for refinements in the future.

There is an important caveat to mention here, which applies equally to EIA processes and any form of auditing. It may be recalled that Orians (1986:5) noted: "Shortage of critical information is the best way to guard the sanctity of strongly held views..." In the context of attempting to provide "better" data, which are more up-to-date and more readily available, many bureaucrats are uneasy, because they feel somehow exposed and more vulnerable to criticism when such information is published (Boschken 1982). There will always be a temptation to be selective about which data are included. Similarly, the manner in which certain facts are presented can easily distort the underlying implications. This tactic has been noted by Forester (1980; 1982). There is currently no simple method to overcome this, other than relying upon the integrity and honesty of the people preparing the report. Intelligent critics will derive some information by assessing what is not included.

2.4 Cumulative Impact Assessment

Dickert and Tuttle (1985:39) defined cumulative impacts as :

> ...those that result from the interactions of many incremental activities, each of which may have insignificant effect when viewed alone, but which become cumulatively significant when seen in the aggregate. Cumulative effects may interact in an additive or a synergistic way, may occur onsite or offsite, may have short-term or long-term effects, and may appear soon after disturbance or be delayed.

Cumulative impact assessment is far less developed than the site specific EIA. Dickert and Tuttle (1985) noted much greater difficulties in predicting, assessing, and documenting cumulative impacts, which they attributed to the difficulty of:

- defining the relevant system and its spatial boundaries;
- identifying the system thresholds;

- capturing the episodic event in the historical records; and,
- separating the natural from human-induced impacts.

None of the difficulties were thought to be insurmountable, but one of the largest problems preventing better analysis was institutional, particularly in the "...lack of conformance between the boundaries of natural systems and governmental jurisdictions." Cumulative impact assessment is particularly relevant to forestry practices, which usually include a large number of geographically isolated but repetitive actions.

Sonntag et al. (1987:1) suggested that traditional EIA tends to:

- ignore the additive effects of repeated developments in the same ecological systems;
- deal inadequately with precedent-setting developments that stimulate other activities, which would not otherwise have been given approval by government;
- ignore changes in the behaviour of ecological systems in response to increasing levels of perturbation; and
- discourage the development of comprehensive environmental objectives that reflect the broad goals of society.

In general, the field of cumulative impact assessment (CIA) has been neglected in the literature and in practice, until quite recently (Dickert and Tuttle 1985; Munro 1986; Peterson, et al. 1987), although Sonntag et al. (1987) noted that CIA was much more advanced in physio-chemical phenomena than in biological and ecological examples. Truett (1987) summarised the experience with CIA in the United States.

Clark (1986:114) noted that in its commonest form, EIA usually deals with a "discrete event, project or policy", while CIA is more concerned with "multiple sources of environmental disturbance" which arise in three ways:

- the same type of source recurs frequently through time;
- the same type of source recurs in a frequent spatial distribution;
- different types of source lead to similar consequences in the environment.

By defining cumulative impacts in time, space and by type, Clark (1986) suggested that CIA could be initiated with the degree of scientific rigour advocated by Beanlands and Duinker (1983). Sonntag et al. (1987) outlined in detail, some conceptual details of how CIA (or cumulative effects assessment in their terminology) might be carried out. Erckmann (1986) noted that although EIA and CIA were both concerned with prediction and measurement of changes attributable to a source activity, CIA differed because it is concerned with the analysis of patterns of change, and therefore demands a very different set of scientific methods from EIA. Among these, is the need to know when the aggregate affect caused by the factor being considered, will reach a threshold of significance, beyond which a different course of action must be taken.

Conceptually, such threshold values would act as a warning system, indicating perhaps the need for more control of say, pollution discharges. In practice, we know very little about how to set the level of these threshold values, the validity of the values already set, and whether or not retroactive clean-up of contaminants (as one example of a cumulative impact) will permit the ecosystem to return to its pre-disturbed state. In addition,

> ...environmental changes and processes that appear to be cumulative are rarely the focus of mitigative measures until they are recognised to have links with human health or other social and economic measures of human well-being (Peterson et al. 1987:2).

CIA also requires a somewhat different bounding process from EIA, including the need for careful delineation of the geographic areas in which effects might accumulate, the time horizon considered necessary to ascertain the duration and magnitude of these effects, and the need to carefully define which "variables or components" of the system being analysed will be used as indicators of the system health or sickness. While such factors are also important for a thorough EIA, their use in CIA involves greater complexity, and therefore considerably more uncertainty. A good example, now attracting considerable attention in North America, is acid rain, which affects a plethora of ecosystems, with a wide range of results.

Cumulative impact assessment is especially relevant to forestry operations, which involve a similar range of disturbances distributed through time and space. Baskerville (1986a; 1986b) and Rattie, Baskerville and Duinker (1987) have described some of these cumulative impacts in the forestry context and noted the need for rigorous scientific study which not only understands how any one impact functions at the local level, but also how these local impacts fit together in a broader time and space scales.

In a forestry context, it can be argued that cumulative effects are the desired result of planned management interventions. For example, a tree ready for harvest may well be the end result of planting, tending, and protection over many years. This interpretation of CIA is clearly valid, but ignores the unknown and potentially detrimental effects resulting from these incremental interventions.

The failure to spend much research time and effort in this area of impact assessment reflects not only the hitherto unrecognised or ignored nature of many of these effects, but also the difficulties of bringing together different disciplines from differing agencies and political jurisdictions, many of which may have conflicting administrative and legislative mandates. Dayton (1986) suggested that this may be a result of the ecologists' inability to communicate with legislators and regulators, most of whom want simple answers to extremely complex problems. Young (1986) noted that in some cases the data needed to make assessments already exist, but the knowledge of their existence does not, because transdisciplinary communications are still weak in many cases.

Geppert et al. (1985) conducted one of the few detailed forestry studies on CIA, in the forests of Washington State. Their initial literature search revealed only ten documents about CIA and forestry, none of which were based on scientific analyses. Their final report made a first attempt to document cumulative effects and provided "a foundation for understanding the subject of cumulative effects as it relates to the regulation of practices in Washington" (Geppert et al. 1985:xv).

2.5 Adaptive Environmental Assessment

As noted earlier, one of the potential strengths of EIA is its ability to provide a feedback mechanism to improve both the process and the product. In many instances, one of the biggest impediments to progress has been institutional inertia, especially when individuals within an organisation create resistance to innovation and change. Adaptive Environmental Assessment (AEA)[16] is widely used as a technique to break down some of these barriers in an attempt to foster better understanding of environmental systems. The guiding principle in AEA is "Expect the Unexpected." In essence, AEA recognises the inherent uncertainty that prevails in many environmental planning issues, and attempts to reduce this uncertainty by building flexible response options into the planning and management processes (Jones and Greig 1985).

AEA is "...a collection of concepts, techniques, and procedures intended for the design of creative resource management and policy alternatives" (ESSA 1982). Walters (1986:43) considered AEA to be a process in which the decision makers and evaluators come together and construct a series of dynamic models which serve

> ...as an intellectual *device* to help people clarify issues, communicate effectively about shared concerns, and explore objectively the consequences of alternative policy options.

The modelling processes used in AEA serve to promote interactive discussion amongst team members, from which a common understanding of problems is developed in a simple caricature of the complex problem. This initial model is then refined and serves as a testing ground for further ideas in the face of known empirical data. Validation or invalidation through an iterative testing procedure serves to expand both theoretical and practical understanding of the problem, and hence, in a relatively short space of time, AEA techniques can sharpen the design criteria that need to be applied in an impact assessment.

Walters (1986:46) describes the process of AEA as a meeting in which people come together "for brief periods of intensive interaction in 'modelling workshops.' Typically, these workshops include:

1. a *modelling team* with some experience in the details of mathematical formulation and computer simulation;

2. research *scientists* with various disciplinary backgrounds and specializations;

3. resource *managers* with experience in the nuts and bolts of monitoring and regulation, and a feeling for the history of the system;

4. *policy analysts/decision makers* with some broad responsibility for defining management objectives and options".

AEA techniques have been applied in a forestry context to spruce budworm problems (Sonntag et al. 1986) and the integration of forestry and wildlife programmes, among others. AEA is not a complete replacement for EIA. Rather, it serves to identify problem areas and introduce innovative solutions, and in this capacity, it acts as an important supplementary technique. It is applicable in research planning, resource management and policy, and project integration and synthesis (ESSA 1982).

3.0 LEGISLATED APPLICATIONS OF EIA IN FORESTRY

The use of EIA in forestry matters is rare in Canada and Europe, but mandatory in the United States. Consequently, most of the literature and experience pertaining to forestry and EIA is found under the jurisdictional framework of the United States. The provinces of Newfoundland and Ontario have environmental legislation which extends to forestry (Ontario Ministry of Natural Resources 1987; Storey 1987) but the state of the art in these two provinces (at least in forestry) is less well advanced. At the Federal level in Canada, the Environmental Assessment Review Process (EARP) established in 1973, applies principally to federally funded projects, programmes and activities. Since forest management is mainly under provincial jurisdiction, the federal government has not yet used the EARP legislation in forestry matters.[17]

In the following sections, two jurisdictions using EIA in forestry are briefly reviewed. The United States has been struggling with EIA in many fields since the passage of NEPA in 1969, and many major advances have been made in the forestry context. In Ontario, the passage of the *Environmental Assessment Act* in 1975 forced the Ontario Ministry of Natural Resources to prepare an environmental assessment for the provincial forestry sector. The application of EIA to forest planning and management remains controversial in both jurisdictions.

3.1 EIA and Forestry in the United States

The United States Forest Service (USFS) has jurisdiction over about 78 million hectares of land, including 155 National Forests. Their experience with EIA has been a central focus for several evaluations (O'Toole 1988; Wilkinson and Anderson 1987; Wondolleck 1988), and forms an essential core of knowledge in appreciating what can or cannot be expected in the application of EIA[18] to forest planning and management. The application of EIA to forestry in the United States has evolved through several major pieces of legislation, including the *Multiple Use Act* of 1960, the *Wilderness Act* of 1964, the *National Environmental Policy Act* of 1970, the *Resources Planning Act* in 1974, and the *National Forest Management Act* in 1986.

3.1.1 Complying With NEPA

The passage of the *National Environmental Policy Act* (NEPA) in 1970 forced all federal government agencies to prepare a detailed report about the environmental impacts of any major actions having a significant effect on the environment. In addition, federal Agencies had to consider "the full range of alternatives (including 'no action') for all projects and submit their environmental analyses to general review and comment." (Clary 1986:179).

Two levels of assessment come into play through NEPA, separated mainly by their level of detail, and opportunities for public review and comment during the process. In every case, the first level is to apply an environmental assessment (EIA) to analyse the project and alternatives to it, and assess what the potential impacts might be. If the responsible agency concludes that there will be no significant impact, they file a Finding Of No Significant Interest (FONSI). By contrast, if significant impacts are identified the agency then proceeds with a second, more detailed assessment which results in the preparation of an Environmental Impact Statement (EIS).

The agency has "considerable discretion" in deciding the extent of public involvement in the EA stage, but much less so in the preparation of the EIS (Wondolleck 1988). NEPA requires that an EIS must analyse:

(i) the environmental impact of the proposed action;
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented;
(iii) alternatives to the proposed action;
(iv) the relationship between local short-term use of man's environment and the maintenance and enhancement of long-term productivity; and
(v) any irreversible and irretrievable commitments of resources involved in the proposed action. (NEPA Section 102(2) (C) 1970)

The Forest Service response to NEPA requirements has been one of trial and error (literally), but the resulting iterations and process modifications have, on balance, led to improvements in showing how the outcomes of land allocations, management activities, and decisions have been assessed. Because forest planning and management activities are considered to be a major activity, the USFS now has a standard policy that all national forest plans will automatically omit the initial EA stage and proceed directly to the detailed EIS (Randolph 1987).

3.1.2 Applying NEPA in the US National Forests

When NEPA came into effect in 1970, there was growing discontent with the way in which the United States Forest Service (USFS) allocated lands for commodity production, and the way in which they permitted clearcutting, especially in areas previously considered as wilderness. One of the immediate results of NEPA was a court requirement, in 1972, that the USFS conduct an inventory and EIA of all roadless areas, which by default, were considered as potential candidates for designation as wilderness. Logging in such areas was clearly seen as a significant activity, worthy of more detailed assessment.

The process became known as Roadless Areas Review and Evaluation (RARE), and it was designed to show how the relative values of wilderness and timber compared. RARE I was successfully challenged in court, which led to another iteration, RARE II starting in 1977. The results of RARE I and RARE II were a mixture of wilderness designations in some areas and accelerated logging in others, to prevent the option of a wilderness designation ever taking effect (O'Toole 1988).

The passage of NEPA forced the USFS to reconsider its planning strategies for the National Forests, and in the early 1970s, they implemented a land use planning system, designed to meet the requirements of NEPA.

At the same time, it became increasingly clear, as a result of NEPA opening up the USFS decision making process to public scrutiny, that much more work was needed to effectively deal with other resource values, beyond the traditional one of standing timber. NEPA spawned a vast array of "soil scientists, wildlife biologists, hydrologists, and other specialists to assemble and analyze basic information." (Wilkinson and Anderson 1987).

In 1974, the Forest and Rangelands Renewable Resources Planning Act (RPA) was passed, mandating the Washington office of the USFS to prepare a national plan, in which all USFS activities would be detailed, including the outputs from timber, recreation, and other resources. These outputs were to be shown in one national document and also by each of the nine forest service regions. These "Regional Guides" then served to establish general policies at the regional and individual national forest level.

Despite these new legislative initiatives[19] many conflicts still occurred. As a means of trying to reduce the number of conflicts and rationalise the forest planning process, new legislation was introduced in 1976, under the guise of the National Forest Management Act (NFMA).[20]

This new legislation saw much more detailed forest planning as the primary solution to conflict, and a new planning process was introduced which mandated each National Forest to prepare a Land Resource Management Plan (LRMP), based on a rational comprehensive model of planning (Briassoulis 1989; Schweitzer 1987).

There are now ten steps required in the development of each LRMP (Sample and Kirby 1983).

1. Identification of issues and concerns
2. Development of criteria
3. Inventory
4. Analysis of the management situation
5. Alternative formulation
6. Effect of alternatives
7. Evaluation of alternatives
8. Selection of alternatives
9. Plan approval
10. Monitoring.

The plans are released first in draft form, and then, after feedback and amendment, a final plan is released. Each draft LRMP is accompanied by a Draft Environmental Impact Statement (DEIS), which outlines the issues of public concern, the alternatives that have been evaluated to meet these concerns, how the USFS proposes to deal with each one, and the alternatives preferred. Following comment on the Draft LRMP and EIS, the USFS selects the alternative most acceptable in light of feedback, prepares a final plan for approval, and defends its selection of alternatives in an accompanying record of decision. These plans are legally binding documents and amendments must be made incrementally through legally prescribed procedures (Schweitzer 1987).

3.1.3 Emerging Concerns

In principle, the requirements of the NFMA were designed to serve the need for comprehensive environmental assessment (thus meeting NEPA requirements) while at the same time providing the better data needed for an explicitly, and publicly accountable decision making process. In practice the Land Resource plans are voluminous and complicated documents that require a sound technical knowledge to understand. To some extent, this complexity results from the use of computer modelling, the inputs and outputs of which are typically not simple to follow. This creates some difficulties for public and agency understanding of how results and alternatives have been derived (O'Toole 1988).

Barber and Rodman (1990) note that despite the apparent sophistication and versatility of these computer models, the outputs still have shortcomings, all of which centre around the problems of "institutional bias, lack of analytical rigour, personal advocacy and unrealistic expectations"; problems which are often common to many planning efforts and not just EIA. In addition, there is a sense that the more detailed planning efforts have not achieved their potential to actually modify practices on the ground, but have provided an effective mechanism for stalling the implementation of decisions made (Behan 1990; Hinson 1990; Stahl 1990).

Each National Forest or forest unit is now undertaking this enhanced planning, with each plan including a full range of alternative undertakings and an assessment of the potential effects. It appears that the whole process is bogged down in a mire of frustration, arcane technical complexity, and political interventions. Today, it is estimated that each forest plan is costing about three million dollars on average to produce, with no guarantee that all of them will ever actually be put into action before further changes are made to the entire process (O'Toole 1988). Wondolleck (1988) suggested that the final number of judicial appeals for all of the 155 plans involved would be in the order of 1200-1300.

Despite this plethora of plans, appeals, revisions, and new plans, the United States' application of EIA to forest planning and management has had many major benefits. These originate primarily in the court mandates given to the USFS which forced them to undertake the technical research needed to examine the environmental effects of harvesting in forest ecosystems. Much remains to be learned, but the breadth of technical research work, and the depth of funding commitment to continue it, is much stronger than is seen in Canada.[21]

This process of court enforceable mandates was helped by the passage of the Endangered Species Act in 1973 which laid out provisions for "mandatory constraints on all land use decisions that might adversely affect the habitat of any threatened or endangered species." (Wilkinson and Anderson 1987). Subsequently, the NFMA mandated the Forest Service to ensure that sufficient habitat is retained to ensure wildlife populations. This in turn required much more attention to adequate data as a means to predict population responses resulting from all the many management activities regularly undertaken. The literature and scientific knowledge that this spawned is substantial and the integration of wildlife with timber management activities is now becoming more sophisticated and better able to meet the expectations of environmental assessment.[22]

In addition to undertaking environmental assessment of forest planning, the USFS has also carried out several assessments of management activities, such as the use of herbicides and slash burning (USFS 1987), and has developed several background papers on the use and application of social impact assessment (Wenner 1984, 1985).

Overall then, the US experience with the application of EIA to forest planning and management has been a mixed bag. Despite, and perhaps because of, the many court battles, there has been progress in assessing the impacts of logging on the rest of the environment. NEPA and subsequent legislation did force the Forest Service to reconsider the way in which planning and management was undertaken, and the level of agency and public knowledge and understanding has increased dramatically.

However, many of the environmental planning techniques developed as a consequence of NEPA are now routinely applied, and some have suggested that the time has arrived to focus more on overall policy directions for the USFS and less on the plans and activities required by NEPA (O'Toole 1988; Renwick 1988).

The main failing that remains, is not one of process, so much as the pervasive corporate ideology of timber primacy, that has always guided the US Forest Service, and, according to its critics, still does (Clary 1986; O'Toole 1988; Wilkinson and Anderson 1987). In effect, no matter what planning and management process is used, it remains heavily biased towards commodity production (lumber) with all other aspects inherent in forest management, being subservient[23] to this primary goal.

3.2 The Province of Ontario System

In Canada, most forested land falls under provincial jurisdiction, with the federal role being restricted to research, funding and administration of the territorial lands in northern Canada. Experience with EA in Canada has been rather different from the United States. The federal government introduced EA legislation in 1973, but this only applies to undertakings that are either federally funded or under federal jurisdiction. So far, forest planning and management has remained a provincial matter, and few provinces have yet extended EA legislation to include forestry matters. The Province of Ontario is an exception to this.

3.2.1 Complying with the Ontario EA Act

In Ontario, the passage of the *Environmental Assessment Act* in 1975, introduced a legislated need for all public sector proponents to undertake environmental assessments of their activities. Initially, many exemptions were granted as proponents sought to avoid the requirements of the *Act*.

The Ontario *Environmental Assessment Act* has several key features which are of importance to forest planning and management. Firstly, the *Act* defines "undertakings" comprehensively, to include any "enterprise or activity" or, any "proposal, plan or program in respect of an enterprise or activity." (Province of Ontario 1975: ss.5-17). Secondly, the definition of "environment" is exhaustive and encompasses social, cultural, economic, and biophysical aspects.

Thirdly, the environmental assessment document, to be submitted for review and approval, must not only show the purpose and rationale of the undertaking, but it must also describe alternative ways of meeting the identified purpose and alternative ways of carrying out the alternative preferred. Throughout the discussion of alternatives, the proponent must also show how they have assessed the environment(s) likely to be affected, the environmental effects anticipated, and the mitigation measures proposed to deal with these. In total, the proponent must convincingly demonstrate, in the environmental assessment submission, a commitment to state of the art environmental planning; the current process shows a gap between theory and practice (Dunster and Gibson 1989).

Once the proponent has an assessment prepared, it is circulated within government departments for review, and, if acceptable, is then released for public review. If major concerns about the proposal and/or the assessment of it, remain, a quasi-judicial hearing takes place before the Ontario Environmental Assessment Board. The EAB makes its recommendations to the Minister of the Environment, who, together with the Ontario Cabinet, can recommend acceptance, modification or rejection.

In Ontario, two basic approaches to EA have been adopted. One is to require a detailed EA for each specific project, which is the classical EA approach adopted worldwide. A second approach, which appears to be unique to Ontario, has been to adopt what are called "Class Environmental Assessments." Although these have no basis in the original legislation, they have evolved through a process of "administrative experimentation" (Dunster and Gibson 1989).

Class assessments were initially defined by the Ontario Ministry of Environment (1981:17) as a means of dealing

> ...with projects which have important characteristics in common. Such projects are relatively minor in scale, recur frequently, and have a generally predictable range of effects which, though significant enough to require environmental assessment, are likely to cause relatively minor effects in most cases. Examples are: electric transformer stations and substations, highway widenings, moderate sized extensions to sewage treatment plants, and communication towers.

The typical class assessment document, applied to the undertakings for which it was originally conceived, includes a generic discussion on purpose, rationale and alternatives, and then describes a streamlined process for planning and approvals for undertakings that arise within the class of projects defined; for example road widenings. If the need arises during the class EA process to examine an undertaking in more detail, provision is made to "bump-up" the project from a class to full individual assessment.

The application of a generic class environmental assessment process to the planning and management of forested lands is controversial. Management activities in forests encompass a wide array of small and large activities, that have individual and cumulative effects, which are not always "generally predictable" or, "relatively minor" in extent. In addition, forest planning and management covers a very large area of public policy, much of which, just as in the United States, is mired in controversy and heated debate.

3.2.2 The Ontario Ministry of Natural Resources' Use of EA in Forestry

The Ontario application of EA to forest planning and management is unique in many ways, and provides an excellent case study of the problems likely to be encountered. The Ontario Ministry of Natural Resources (OMNR) has responsibility for the forested lands within Ontario, and sought to comply with the legal requirements of the *Act* by preparing its first submission in 1977. This submission was rejected, following internal review, and it took a further ten years and four more iterations of the proposal before the OMNR finally had a document (Ontario Ministry of Natural Resources 1987) ready for scrutiny before the Ontario Environmental Assessment Board (EAB). Formal EAB hearings on the proposal started in May 1988 and are not expected to be complete at least until mid 1991. So far, there has been only one detailed evaluation of the process and product leading up to the hearings (Dunster and Gibson 1989).

The original focus of the MNR was on the assessment of forest management. However, criticism of the narrow focus in the 1983 version led the Ministry to change the title to "timber management" in version four, released in 1985; an explicit recognition by the MNR that the process they proposed was insufficient to cover all aspects. The change in title had very important ramifications, not the least of which was the way the proponent could then define the alternatives to the undertaking. By adopting a very narrow focus in the assessment (timber management, rather than the whole gamut of activities inherent in forest management), the MNR was then able to argue for alternatives that were conceptually narrow, and practically unrealistic, thus limiting the scope of the final assessment (Dunster and Gibson 1989).

Rather than adopting the U.S. system of subjecting each management unit plan to an EIA, the Ontario approach has been to try and integrate EIA principles into routine planning methods. Thus, the management planning system previously in use has been adapted in an attempt to comply with the requirements of the *Environmental Assessment Act.*

The class assessment for timber management, which outlines a very broad generic process, requires each forest management unit, of which there are 114, to prepare a timber management plan. These plans now become the main product of the class EA process, and in theory at least, document the environment likely to be affected, the environmental effects anticipated, and the mitigation measures deemed necessary to limit undesirable effects to an "acceptable" level. Opportunities for the public to comment on these plans are provided throughout the five year planning cycle at predetermined stages. Each plan goes through six main steps.

- preplanning
- objective establishment
- strategy development
- determination of management operations
- plan production and submission, and
- plan review

(Ontario Ministry of Natural Resources 1986)

In addition to the plans prepared at a management unit level, the MNR has prepared a series of manuals and guidelines, some of which are mandatory[24] in application. These cover the construction of roads and bridges, the consideration of assorted forms of wildlife, and tourism values.[25] These documents are the main source of specific technical guidance, and provide the only real indication of how the MNR considers the methods of management to be utilised. Although they were not a part of the original assessment submission, they have all been scrutinised in the ongoing hearings process.

3.2.3 Emerging Concerns

There are several major problems with the Ontario process, which remain unresolved and in need of attention. Conceptually, a generic, class environmental assessment process, could be designed to provide effective assessment of many of the repetitive activities found in timber and forest management policies and practices. Such a process could also address cumulative effects, and the effects of provincial policies, centralised planning and management decisions, and the way in which guidelines and management procedures are to be implemented.

Additionally, an effective process could help in the evolution of innovative integrated management solutions. Sadly, the current process in Ontario fails to meet many of these criteria. By adopting the narrow focus of timber management and not the more realistic basis of forest management, the Ontario Ministry of Natural Resources is advocating a strategy of "disintegration" wherein all uses of the forest other than wood fibre supplies, are seen as constraints to timber management. Clearly, it is quite impossible to practice integrated resource management this way, and thus the narrow focus of timber management fails to meet a central goal of contemporary practice.

Adopting the narrow focus of timber management as a strategy to limit the assessment and subsequent public debate to a narrow examination of policy, planning and management issues, has failed. Intervenors in the ongoing hearings have not felt constrained to examine only the timber aspects. They have argued, correctly, that timber activities affect the whole forest, and that a credible assessment must take this into account.

It also remains unclear how or if, the MNR will integrate past land use planning efforts into the current process, and where the limits of discretion lie (if indeed there are any) in the application of the many manuals and guidelines that are now emerging. Similarly, although provision is made to "bump-up" class assessments to a full EA if needed, there has been very little explanation of what criteria would be used to determine the need for a bump-up, and it remains unclear how a full EA would differ from the class EA.

The almost complete lack of quantified data upon which effects, predictions, and mitigation measures can be based has also proved problematical. Basing an entire assessment on hypothetical results, and claiming that the anticipated results of most timber management activities around the Province will not be detrimental, has not inspired confidence. As noted earlier, this is a typical problem with many EA processes in the biophysical arena, and similar problems were encountered in the Unites States.

It is accepted that progress can only be made with sound scientific research and experimentation, all of which does require time, funding, careful evaluations, and iterative feedbacks to allow process and design changes. But, the lack of progress in Ontario since 1976, is surprising and although the current hearings are sharpening the focus on the many conceptual and data discrepancies that have emerged, it is far from clear how these will be overcome in the future.[26]

Whether or not this extraordinarily expensive forum for debate will actually ever make any difference remains unknown at this time. Indeed, it may all be irrelevant at this stage, since the MNR actually went ahead and implemented the entire process in 1983, without any approvals, and has been tinkering with it ever since.

Consequently, given the massive expenditures of time and public money[27] incurred in the Ontario assessment, the Environmental Assessment Board is faced with a difficult final decision. Dunster and Gibson (1989) suggested that there were three basic options. One, is to reject the entire assessment on the basis of the many deficiencies identified and require a re-submission. This is unlikely for political reasons and realistically, would not solve any of the problems. A second option, at the other extreme, would be to accept the assessment as submitted with no further comment. This is also unlikely.

The most likely option, indeed the only one that offers some hope of political and public acceptance, will be to accept the submission on an interim basis, but with a very specific set of conditions to not only guide the interim period, but also to introduce a schedule of tasks to improve and revise the current approach. Compliance with these conditions would be needed within about five years; long enough to implement the changes needed but not so long as to allow the whole issue to be forgotten.

The conditions regarded as essential by Dunster and Gibson (1989) would include a province wide policy assessment to address broad policy issues, the results of which would then serve as guidance for a revised class environmental assessment process. Specific conditions recommended include:

- a shift in the assessment from timber management to integrated forest management
- effective consolidation of currently available data (at provincial, regional and local scales) to reveal

publicly, how much is or is not known about the forests, their biological capabilities, and the current and potential values available;

- consideration and evaluation of cumulative effects (other than those intended) and how these will be assessed;

- production of a single environmental assessment document that explicitly lays out the process, the associated documentation needed, the commitments made, the responses planned to the final decision of the EA Board, and how all of these will be kept revised and available for public scrutiny.[28]

Above all, the Ontario process must muster more coordination between the various levels (local, regional and provincial) and scales of activity (stand, forest, landscape), and actually get on with providing a realistic basis for integrated forest planning and management efforts.

The Ontario experience in applying EA to forest planning and management has similarities to the US in its use of the management unit as the main planning focus. But the US process is far more comprehensive; it explicitly considers the whole forest as its starting focus, rather than merely the standing timber; it makes more effective use of policy assessments to guide lower level initiatives; and it has a process that is legally enforceable and more explicit. However, the US process is excessively bureaucratic, time consuming and costly.

The MNR clearly attempted to avoid the problems seen in the US, but in doing so, it has created a different, but no less serious, set of problems, and it remains unclear why the lessons from the US experience could not have been better incorporated into the Ontario approach.

4.0 DISCUSSION

Conceptually, the application of EA principles and techniques to forest planning and management ought to be feasible. Moreover, the expectation that EA will lead to less serious environmental consequences, as a result of careful scrutiny, more thoughtful designs, and process improvements, is not unreasonable. Despite this, experience with EA and forestry has often been disappointing; expectations have not always been met, especially when major policy issues remain unanswered, and many of the crucial cause and effect linkages between timber management activities and environmental quality objectives, remain largely unknown and untested, and in many cases, simply not even considered.

It is important to remember that EA is merely a process that can facilitate decision making. Consequently, what we call the forest planning and management process (EA, integrated planning, etc.) really does not matter as much as the visible results on the ground, and the degree to which these results match or do not match societal expectations, and ecosystem realities. Ultimately, the crucial need is for technically sound and achievable plans and management actions on the ground; only then can we derive truly sustainable outcomes.

It will be recalled that the essence of a successful EA approach is the integration of techniques and disciplines during planning and management; the development of a specific focus with well defined goals and objectives, and the design of the undertaking with clear consideration about how the results will be integrated with other programmes and the needs of society. As a result, the EA becomes the explicit public record of the factors and data involved, and demonstrates how these led to a decision. Ideally, an EA process evaluates an existing process to see how well the environment affected and environmental effects have been considered. Eventually, the goal is to enhance the existing process to routinely consider such matters. Note however, that EA is not a substitute for sound technical planning.

Yet, despite the conceptual merits that EA clearly has, experience in two different jurisdictions appears to indicate that the process does not work well. Why is this? Is it possible that the use of EA is an inappropriate process to apply to forest planning and management? If so, is there a better, different approach to be tried that would resolve some of the present failings of EA? And, if there is, will it have any better chance of success than EA?

The answers to these questions depend to some extent on one's perception of what is or is not acceptable planning and management. It is the manner in which EA has been implemented that is at least as important as the substance of the EA. In effect, the cause of failure is just as important as the failure itself.

4.1 Is There One Workable Process?

The application of sophisticated forest planning and management processes pose difficult challenges, because the sheer extent and complexity of forest ecosystems defies any simple process, by which all actions can be dictated. Despite this problem, it is important to rigorously assess the cause and effect linkages derived from planned and unplanned interventions in the forest. Of at least equal importance, there are many different aspirations, expectations, and value systems among the public, who are playing an increasingly important role in planning and management; these also need rigorous assessment.

Moreover, the management of these forests for multiple outputs requires many different planning and management techniques, drawn from several disciplines. Given so much societal and ecosystem complexity, it may be unrealistic to hope that there will ever be just one planning and management process to cover all permutations, no matter what it is called. However, it is not unrealistic to hope that the problems can at least all be characterised and investigated in a compatible manner.

In Ontario, and to a great extent in the United States, the EA process requires the detailed assessment of planning and management options to be undertaken at the forest management unit level. This has many attractions, especially in the ability to utilise local knowledge and understanding effectively. But, to expect locally based efforts to tackle and resolve the broader policy questions and conflicts may be unrealistic if there is no overall guidance at a provincial level. Lower level planning initiatives need a context for action, and, at the same time, they provide the necessary field experience to guide amendments and refinements of higher level decisions.

Much of the controversy around current EA applications in forest planning and management stems from a failure in the application of the EA process, and not failures in the concept of EA. Thus, using the assessment process merely because it serves as a means of obtaining project approval, defeats the spirit and intent of EA (although EA has often been treated that way). The goal of EA is to facilitate better, more informed decision-making, thus affording the environment affected more attention, and theoretically, minimising the extent, duration, and distribution of any adverse effects that have been anticipated.

Early assessments contained very little good science (Beanlands and Duinker 1983; Rosenberg et al 1981), but it is a mistake to believe that assessment decisions can be based solely on scientific review and analysis. Technically sound assessments require a compromise between complete reliance on science, without a political context for action, and political decisions without a basis in science.[26] Either extreme will contribute to a failure in the assessment process.

The reality under which environmental assessments are undertaken is typically amorphous, and experience with EA shows that most conflicts and disagreements are not so much about the "facts" but far more about peoples' beliefs and values. And, inevitably, decision makers and their supporting staffs, indeed much of the workforce, all live and work in institutions that have a latent corporate ideology guiding the entire philosophical approach to planning and management. This results in subjective decisions which purport to meet the public interest, when in fact, there is rarely one single "public interest" defined and objective solutions, like beauty, are found solely in the eye of the beholder.

There has to be a trade off between higher and lower levels of decision making. For forest planning and management to be sustainable (for whatever attributes we choose), we need to clearly define and understand the biological capabilities and responses of the landscape, not only in terms of potential to grow wood fibre in successive crops, but also in terms of environmental quality objectives such as wildlife habitat, water quality and quantity, aesthetics, spiritual and cultural values. There can be no other way to gain this knowledge than from the bottom up, based on the results of technically sound field research. Top down planning, and forecasting the duration, extent and distribution of anticipated effects and outcomes in the absence of sound biological knowledge, will never be more than guesswork.

By contrast, some of the broad goals and objectives of society can be planned at a higher level, and some broad policy commitments can be made as guidance for use at the lower levels. Top down guidance of this form will work as long as it incorporates sufficient flexibility for application at the site specific level. The big challenge for resource planning is to match the top and bottom levels in a process (regardless of whether it is an EA process or a routine planning process) which:

- offers equitable opportunities for input from all the stakeholders involved;
- does not swamp the planning system in documents and plans that are not readily understandable or believable, and lengthy and costly litigation proceedings;
- is effective in achieving well defined qualitative and quantitative objectives for improved environmental planning,[30] and,
- offers flexibility for local planning initiatives without loss of coordination for higher level goals.

As we draw closer to the end of the century, decision making is becoming more complex, in response to increasingly competitive, and often mutually exclusive demands on the forested land base. If all these demands are to be treated equitably, there is not one simple planning and management process that will accommodate all cases. The problem is complex and will demand a complex solution.

Decentralisation of decision making power is reasonable as long as there is some guidance on the broader policy issues. But, as the hearings now underway in Ontario demonstrate, some of the technical data available at local levels are inadequate to make any scientifically credible decisions, and the present process does not encourage a simple remedy. In the absence of a broad policy assessment by which local planning can proceed, the Ontario class environmental assessment process places most, if not all of the onus for problem solving at the local level. This cannot work well if all the power for ratification lies at a senior level. All levels of assessment require a context in which to exist.

To try and circumvent these data problems, the Ontario process advocates extensive use of assorted manuals and guidelines, some of which are mandatory in application. The difficulty now arises in knowing how to apply "guidelines" in a mandatory fashion. In the absence of site specific technical data, from which specific guidelines might be derived, many of the present documents remain at a conceptual level, presenting hypotheses that await validation. Since this might well take ten to twenty years to achieve, how will any assessment process allow for the inherent uncertainty involved and yet still attempt to make credible forecasts?

The most reasonable solution seems to be to advocate some degree of caution in the face of this uncertainty. At the same time, rigorously thought out experiments should be initiated to better understand the many cause and effect linkages taking place between timber management activities and other components of the broader forest environment. This would help to refine the guidelines and the range of options available for future planners.

The United States efforts to integrate broad assessments into a national and nine regional assessments seems more logical. Even so, the entire process is complex and almost constantly mired in litigation as vested interests compete for the attention of the decision makers. As O'Toole (1988) has pointed out, it will take one or more iterations of the top down and bottom up processes before the two come into balance, each adapting to the input of the other.

4.2 Two Areas For Broad Policy Assessment

Most contemporary forest conflicts centre around the issue of land allocation (purposes) and the way in which management is undertaken (practices). These two broad policy questions need addressing in most Canadian forest planning and management debates. Both questions form a vital, and very fundamental starting point for any assessment issues at the local level, and must be addressed effectively at the broad policy level if local efforts are to function well.

4.2.1 Assessing Land Allocation Decisions

Whatever the process is called - impact assessment, a comprehensive land use strategy, or strategic land use planning (as was attempted in Ontario) - there is an urgent need to actually reconcile the competing interests which are placing the land base under increasing pressure. Aboriginal land claims, demands for parks, wilderness areas, dam impoundments, and ecological reserves, in addition to the need to define a more permanent land base for growing wood fibre, all compete. It is not physically possible to manage for all of these uses at the same time and place; many of them are mutually exclusive options and we have to choose one or the other.

Broad policy assessments involving all the stakeholders are necessary. The US experience with RARE I and RARE II was not the perfect model, but at least they tried to address one specific set of issues at the state and national level. The Strategic Land Use Planning (SLUP) process in Ontario was a similar effort, and again, although not perfect, it did at least move in the right direction. Both the RARE and the SLUP processes demonstrate the difficulty in achieving consensus in complex biological and societal problems. Despite these difficulties, such an assessment is vital if progress is to be made on the second area of concern.

4.2.2 Assessing Management Practices

Once the land allocation assessment is addressed, we then need to consider the policy implications of management activities.[31] The tremendous variation in forest ecosystems should not deter the need to increase our understanding of cause and effect linkages in an attempt to refine knowledge about reliable prediction and mitigation methods. There are two aspects to consider here.

One is the need for better understanding about cause and effect linkages in a broad sense, including an overview of how much is, or is not known. This overview level then directs the second aspect; the research work needed to elaborate the details, gather useful data, test hypotheses on the ground, monitor and evaluate the results, and report them so that iterative work can adapt and modify management practices as necessary.

The first level of assessment, the broad overview of cause and effect linkages, would be an excellent mandate for a provincial environmental audit, which would then lay out the extent of current knowledge and understanding (and the lack of it) and provide direction for future research. The second level, detailed elaboration of specific aspects, is already being reported in numerous scientific reports and articles. As a means of communicating the detailed research results, a State of the Forest report might be an ideal forum.

Both levels of evaluation would be undertaken to elucidate how much data is available, their credibility and the tolerance limits with which they can be applied, and the extent to which the absence of data is forcing us to operate in ignorance of the true significance (extent, duration, and distribution) of potential environmental effects.

The latter point is important for decision making, since there is a tendency to focus on what is known and not on what is unknown. Recognising the extent of our ignorance may be more important than refining the absolute limits of understanding on a small range of attributes and linkages.

4.3 Data Problems

Not only do we need more credible data, but we also need more open access to the data. In many cases there have been tedious debates about whose facts are correct. The extent to which the data are credible determines all the subsequent prediction, mitigation, and monitoring work. If the data are wildly inaccurate, all subsequent work is inaccurate too. However, we have to start somewhere, and testing the data for validity in the field is an important step. The use of publicly accessible computer data banks might be a useful option in providing better access to data. The main impediment to progress on the issue of better data is typically a lack of political commitment (staff and funds) to carry out the work needed.

The whole question of risk analysis is important in the debate on data. In some cases the tolerances in the data may be quite wide, but not enough to matter. Seeking the ultimate truth is often unnecessary and wasteful of time and money that could be more usefully employed elsewhere. It is more important to recognise the general magnitude of the problem and design ways to deal with it, knowing that the absolute magnitude will reveal itself as research and testing proceeds. Such an approach is very much in line with the philosophy of adaptive environmental assessment, in which the flexibility to react to unexpected changes is an integral part of the overall process.

It remains virtually impossible to make realistic predictions about anything if there is no quantified basis to work from. A crucial part of this is the determination of the best criteria to be assessed. There is no need to collect data on absolutely everything and then never use it. Such an approach wastes time and money, and achieves little. What is needed is a sounder basis for assessing matters such as wildlife habitat. What are the valued ecosystem components that determine the viability of these habitats? Are there some measurable attributes that will serve to act as broad indicators of ecosystem health? If we can determine these, then work can proceed to quantify and understand them. This knowledge can then be used to modify practices so that the integrity of valued ecosystem components is carefully protected.

The US experience in integrating timber and wildlife concerns has proved that progress can be made, although there will always remain some discontent, especially when existing vested interests are directly affected by the outcomes of increased knowledge and understanding.

4.4 Assessing Progress

The whole issue of how we assess progress needs more work. In the absence of quantified predictions, monitoring will always remain a very subjective matter, dependent upon ideological biases, reinforced by training and employment. It may be qualitatively obvious that one or more valued ecosystem components have deteriorated in response to one or more management activities.

For example, stream water quality and quantity may be worse after logging than before. The issue is not that it occurred (although blatant denial remains an unfortunate, and undesirable part of many management processes), but that we cannot assess the severity or duration of the event, and consequently we cannot know how best to modify practices to try and mitigate future events.

There is no doubt that past management activities have not always produced desirable results, but the degree of environmental concern in the past was much less, and many past practices were tolerated by the standards of the day. Rather than reflect on the past, we must now look to the future. Many, though not all, of the environmental concerns now being raised do have a legitimate foundation in science. Consequently, they have become the challenges of the day and must be assessed; the assessment must lead to improvements; and the improvements must be institutionalised in some form so that they become the new routine standards. Failing that, progress will never be made.

Part of the progress needed is to develop better and more credible means of auditing and reporting the results in a publicly and politically credible manner. There have been many calls for independent forest audits, but how these would be carried out, and more importantly, by whom, has not yet been decided.

Much work remains to be undertaken at this level.[32] The use of State of the Environment Reporting, perhaps in a State of the Forest report should be explored in more depth, to include some guidance about how future work might establish better prediction and monitoring protocols, and the identification of data and knowledge gaps for future research work.

5.0 LESSONS TO BE LEARNED

The first lesson is that the application of EA to forest planning and management has the potential to reduce conflicts by demonstrating how more thorough and technically sound environmental planning methods can yield improved decisions. This does not mean that the application of environmental assessment can or should replace the need for technically sound planning and management in the first place; but it does suggest that routine planning initiatives can be enhanced, or in some cases maintained at some minimum acceptable level of performance if they are subjected to an EA.

The way in which the EA process is applied, is often far more important than the process itself. EA evolved as a means of elaborating uncertainty, in an effort to enhance the decision making process. As a result, EA practitioners can expect to find more complexity as the elaboration process unfolds. This complexity, some of which will be based on scientific research results, is still used subjectively in the final decision making processes. Consequently, an equitable EA process acknowledges this and attempts to foster a workable solution that is acceptable to all the stakeholders while still meeting the broad objectives of better environmental planning and management.

Wondolleck (1988) provides an excellent review of these problems, and suggests that there are five essential steps for successful decision-making:

1) Building trust
2) Building understanding
3) Incorporating conflicting values
4) Providing opportunities for joint fact-finding
5) Encouraging cooperation and collaboration.

The key to these steps is the way in which participants in the EA process can present their concerns themselves and not have them assimilated by professional land managers. The attitudes of the participants involved in any process are often more important than the details and "facts" involved. Resource managers must recognise this and learn to deal with it.

The second lesson is that there is no one simple process that will address all the problems all the time. The philosophy of adaptive management, expect the unexpected, should remain high on the agenda, and any EA processes used must retain some flexibility to respond swiftly to changing circumstances. That being said, this flexibility must not be abused so as to permit constant avoidance of what are undoubtedly very difficult problems.

Thus, Ontario's use of a generic process for timber management will only work if all the other attributes of a forest are ignored and timber management can proceed in isolation of all other effects. Such conditions are unlikely to ever prevail, so the EA process and the routine planning process it purports to enhance, remains flawed. The broader policy questions, which are so vital to the local planning and management initiatives, remain as areas of speculation and doubt. There is a need for top down and bottom up initiatives; the former can not be useful without a good factual basis derived from the latter. It will take several iterations to bring the two levels of planning into synchronisation.

A third lesson, is that the need for better data is of paramount importance. Many of the cause and effect linkages resulting from timber management remain poorly understood at best; some are little more than speculative guesswork. Elaboration of these cause and effect linkages is a crucial requirement if future planned interventions are to yield the results desired.

Meeting this need for better data requires a long-term political commitment to funding technical research. It is obvious that we can never have all the answers, but in the absence of any answers at all, we will always be operating in ignorance of the true effects, or even an indication of the magnitude, duration, and extent of effects that result from current practices. An important caveat on the issue of data, is that they not only be credible, but also that they be made widely available. In the Canadian context, most EA and forest work occurs on Crown land, and there appears to be no good reason why publicly funded research should result in privately held results.

The fourth lesson is that the use of EA brings with it the need for a commitment of staff time, funding, and a political commitment to follow the process through fairly. EA is a means to enhance decision-making, but it has to be accepted that in some cases, better information, more credible data, and closer examination of projects, processes, and activities, and all the various alternatives available for these, should lead to major shifts in planning and management. This challenge to established vested interests will create friction, but this should not deter practitioners from improving environmental planning through the diligent use of EA (or any other similar processes).

Finally, EA is not the only means of achieving enhanced decisions. EA is an aggregation of techniques and planning principles, founded on the need for interdisciplinary thought and action. The title of "environmental assessment" now has an entrenched aura about it that can be an impediment to its application. Other processes, involving essentially the same ideals but without this impedimenta, can be used just as effectively. For example the special area management processes (SAM) (Brower and Carol 1987) developed in the United States, has been utilised very effectively as a means of implementing innovative solutions to resolve complex resource management conflicts. There is no reason why similar efforts can not be applied in a forest planning and management context. Political commitment, dedicated people, and imagination, will go a long way.

6.0 IMPLICATIONS FOR BRITISH COLUMBIA

The planning and management of forested lands in British Columbia is not yet subject to any institutionalised form of environmental assessment.[33] New manufacturing facilities are subject to the recently released Major Project Review Process, and plans are underway to implement a Forest Development Review Process, which would link the allocation and issuance of new tenures to the broader facility process. However, a formal environmental assessment of the existing planning and management processes is not used or apparently, planned. That being said, the current planning processes for the existing tenures and their associated development plans, do incorporate some of the main principles of EA, such as public involvement, and some assessment of the environment affected and potential environmental effects.

The need for technically sound planning and management processes should be undisputed. The application of EA to routine processes can yield useful additional information which will enhance, at least in theory, the decisions made. However, as the US experience has shown, this approach has costly and time consuming ramifications which are onerous for all concerned. The alternative is to try and build in environmental assessment principles into the routine processes and thus avoid a second process.

The Ontario experience provides a good example of how not to proceed with this alternative. However, despite the Ontario problems, the concept of enhancing routine processes has appeal, and if handled in a more open and forward thinking manner, it could yield the desired combination of technically sound interventions in an environmentally acceptable manner.

How (or even if) British Columbia chooses to proceed with environmental assessment of its forested lands will depend on whether or not the existing planning and management processes are seen as adequate or in need of improvement. Typically, the latter is more likely, since an evolving understanding of cause and effect linkages brings with it a continuing need for refinement of planned interventions. If an environmental assessment process is advocated in British Columbia, there is now a sufficiently large body of experience available in the application of EA to forest land management, for some major improvements to be made.

7.0 CONCLUSIONS

Any form of sound environmental planning and management of forested lands, will introduce additional assessment and decision-making complexity. This is inevitable; simple decisions can only be reasonably made with simple factors. Complex factors require more complex evaluations. This does of course assume that the decision making process is thorough, and has a desire to be equitable to both humans and the broader non-human environment.

This may not always be the case, and certainly there are plenty of EA case histories where work was undertaken merely to secure project approval and the necessary permits; once these were granted many of the EA considerations were abandoned in favour of the older paradigm of development at any cost.

Despite all the many difficulties still encountered in the application of EA to forest planning and management, the concepts of EA have the potential to refine planning and management processes, thus enhancing our knowledge and understanding of how to better manage forested lands for sustainable and multiple outputs. The application of EA is still far from perfect, but it has come a long way since the early days following NEPA, and given the chance, can go much further yet in fostering better environmental planning.

ENDNOTES

1. The jargon in EIA literature is immense. The "undertaking" refers to the plan, policy, or project that is being assessed. Undertakings, in whatever form, are initially designed by a "proponent" who is typically responsible for preparing the initial assessment of the undertaking and then defending it under subsequent scrutiny.

2. The application of scientific rigour in EIA is still problematic. In many cases the knowledge necessary to yield an acceptable answer is not available and would require extensive research to achieve. Time and money constraints, coupled to political agendas, typically preclude the level of scientific research needed to address many EIA issues, although this is slowly changing as court decisions mandate the work needed.

3. This can also be achieved in non-EIA situations, but typically requires extraordinary planning efforts. See for example Brower and Carol (1987) in which they outline a planning method termed "Special Area Management."

4. A useful overview of planning problems is found in Chapter One of Voogd. Multicriteria Evaluation for Urban and Regional Planning.

5. There is a presumption here that the content of the EIA has not been subverted for political ends, which may not always be true. See Bacow and Wheeler (1984).

6. An EIS or environmental impact statement is the final stage in the US process. The EIS is the document in which the results of an EIA are presented.

7. This of course raises the question of significance for what and to whom, and many assessments bog down in trying to maintain efficiency and equity at the same time.

8. In the United States, this broader policy level is addressed by other means, including the need for an overall assessment of current and future resource needs and uses. This can be carried out under the auspices of the Forest and Rangeland Renewable Resources Act (1974), for example.

9. In a forestry context the costs of EIA compliance in the United States are staggering. O'Toole (1988) has assessed the Forest Service planning process and suggests the average cost of one forest plan may now be $ 3 million. Even then, there is no certainty that political interference will not lead to major, almost continuous, and increasingly costly revisions.

10. The attempt to meet environmental assessment criteria for forest management in Ontario, is one of the more definitive failures in this regard. See Dunster and Gibson (1989).

11. Beanlands and Duinker (1983) provide an excellent discussion of the bounding issues and their application to EIA.

12. The EIS on Managing Competing and Unwanted Vegetation (United States Forest Service 1987) resulted from an earlier court challenge in which the original submission was found to be insufficient in scope. This particular case is a good example of what can happen with poor initial planning. Similar issues are raised in the evaluation of EA in Ontario's forests. See Dunster and Gibson (1989).

13. The whole issue of gathering and using baseline data is a difficult area of EIA. Duinker (1989) provides an excellent background on the problems of baseline data and their use in EIA monitoring.

14. Note that the concept of acceptability involves risk analysis, but in many cases, especially those involving complex engineering work, much of the threshold levels of "acceptability" may be hidden in the EIA document. Typically, this only emerges during effective cross examination during the EIA hearing, when experts can challenge assumptions and standards.

15. Manitoba recently passed legislation to require a provincial SOER every five years. The Regional Municipality of Waterloo completed its first SOER in 1987, and Environment Canada published the first federal SOER in 1986.

16. It is also known as Adaptive Environmental Assessment and Management (AEAM) in some texts. See for example Jones and Greig (1985).

17. The recent successful court challenges to the EARP process and its application to dam construction in Saskatchewan and Alberta, may have significant implications for the future of federally funded forestry projects.

18. The use of the acronym EIA is correct for the US process, which includes the initial EA and a subsequent EIS if necessary. In Canada, the acronym EA applies to the concept and entire process of assessment, not just the initial stages.

19. Some critics have suggested that continuing problems between the USFS and opposition groups was exacerbated by the passage of NEPA and RPA. See Clary 1986; O'Toole 1988; and Wilkinson and Anderson 1987. These three references provide very comprehensive coverage of the USFS from its inception through to the eighties. Readers interested in following the evolution of the USFS are directed to these books.

20. An excellent guide to the provisions of the NFMA and how they might be interpreted is found in a small book called National Forest Planning. A Conservationist's Guide, by Sample and Kirby (1983).

21. It might be argued that a strong political (federal and provincial) and industrial commitment to funding technical research would achieve the same results as are seen in the US, without the pain and costs associated with the US planning system.

22. The seminal work on the subject is probably Jack Ward Thomas' book Wildlife Habitats in Managed Forests, published in 1979. Since then, there have been many excellent manuals and reports showing how essential wildlife habitats can be retained and integrated with timber management.

23. O'Toole (1988) provides an excellent description of the many problems facing the US Forest Service, and especially the manner in which planning processes have been skewed towards the status quo option of timber management first and foremost.

24. The "mandatory" application of "guidelines" raises an interesting point about the role and function of guidelines as a source of direction. Recognising that some flexibility is necessary and that professional judgement will be used in the planning and management process, it may still be difficult to ascertain when the guidelines had or had not been applied.

25. Conceptually, it be possible to argue that these manuals and guidelines are in fact a form of province-wide activity assessment in their own right. Although they were never designed in this way, it may be possible to improve the technical quality and format of these documents to meet the need for provincial activity assessments; in effect each document could become a form of class assessment.

26. This is not to say that there has been no research on many of the crucial aspects inherent in timber and forest management in Ontario; much excellent work has been undertaken. Rather, the surprise comes in finding the fragmented nature of these efforts, and the way in which they do not appear to address the major concerns emerging from the EA process since 1976.

27. The exact costs of the hearings is not known and may never be evaluated. However, estimates range from $ 20 to $ 30 million for the entire hearings process, and this makes no allowance for the twelve years of effort already spent in arriving at the hearings. It seems unlikely that any other provinces will approach the problem in the same manner.

28. This will be a difficult task, since the EA Board has previously ruled that all evidence submitted during the hearings is now considered to be a part of the EA.

29. Decision makers might prefer the simplicity of a few numbers as *the answer*, but the important issue is how these numbers were derived, the assumptions that were used, the credibility of the original data, and the manipulation processes used to derive the answers. Varying one or more of these factors may yield entirely different answers *from the same raw data*.

30. Achieving improved environmental planning necessitates carefully and clearly defined goals and quantified objectives, the measurement and monitoring of which, will demonstrate whether or not we are actually making any progress. The lack of quantifiable objectives is a major failing in the Ontario process.

31. There is of course a strong link between the results of allocation and the extent and intensity of management activities, and assessments of allocation and management activities do overlap and influence each other.

32. The whole question of how to maintain independence of the auditor is very tricky. Much of the public, rightly or wrongly, places little faith in government audits because it represents the government auditing themselves; not a good prescription for objectivity. The same problems apply to industrially supplied data. If the data are not supplied and validated by either of these two groups, who would undertake this? Consulting companies also have ideological biases, and realistically, it is hard to retain absolute professional objectivity when your business depends on supplying politically acceptable answers. That only leaves the public, and since most do not have a) time and money to do the work, and b) the technical background to understand the intricacies of all the data, that too is unacceptable. The most likely answer will be some form of standing committee, under government control, which invites representatives from all the stakeholder groups to serve for a certain period of time.

33. The following section is based on discussions with Mr. Bob Harding, Ministry of Forests, Victoria. September 13, 1990.

LITERATURE CITED

Archer, D.F. 1985. Report on the Audit, Forest Management Activity, Ministry of Natural Resources. Toronto: Ministry of Natural Resources.

Armson, K.A. 1976. Forest Management in Ontario. Toronto: Ministry of Natural Resources.

Bacow, L.S. 1980. "The Technical and Judgemental Dimensions of Impact Assessment." EIA Review 1(2):109-124.

Bacow, L.S., and Wheeler, M. 1984. Environmental Dispute Resolution. New York: Plenum Press.

Barber, K.H., and Rodman, S.A. 1990. "Forplan: The Marvellous Toy." Western Wildlands 15(4):18-22.

Baskerville, G. L. 1986a. "Forest and Wildlife Management" In Managing the Legacy. Proceedings of a Colloquium on the Environment, pp.33-44. December 1985. Ottawa: Economic Council of Canada.

———. 1986b. "Some Scientific Issues in Cumulative Environmental Impact Assessment" In Cumulative Environmental Effects: A Binational Perspective. pp.9-14. Hull: Canadian Environmental Assessment Research Council.

———. 1986c. An Audit of Management of the Crown Forests of Ontario. Toronto: Ministry of Natural Resources.

Beanlands, G.E. 1985. "Ecology and Impact Assessment in Canada." In New Directions in Environmental Impact Assessment in Canada, eds. V.W. MacLaren and J.B. Whitney, pp.1-20. Toronto: Methuen.

Beanlands, G.E., and Duinker, P.W. 1983. An Ecological Framework For Environmental Impact Assessment in Canada. Halifax: Institute For Resource and Environmental Studies.

Behan, R.W. 1990. "The RPA/NFMA: Solution to a Nonexistent Problem." Western Wildlands 15(4):32-36.

Bisset, R. 1980. "Methods For Environmental Impact Analysis: Recent Trends and Future Prospects." Journal of Environmental Management 11(1):27-43.

Boschken, H.L. 1982. Land Use Conflicts. Urbana: University of Illinois Press.

Briassoulis, H. 1989. "Theoretical Orientations in Environmental Planning: An Inquiry into Alternative Approaches." Environmental Management 13(4):381-392.

Brower, D.J., and Carol, D.S. (Eds) 1987. Managing Land-Use Conflicts. Case Studies in Special Area Management. Durham: Duke University Press.

Brown, J.H. 1986. "Commentary I" In Cumulative Environmental Effects: A Binational Perspective, pp. 15-17. Hull: Canadian Environmental Assessment Research Council.

Canter, L.W. 1977. Environmental Impact Assessment. New York: McGraw Hill.

———. 1984. "Environmental Impact Studies in the United States" In: Perspectives on Environmental Impact Assessment, ed. B.D. Clark et al. Dordrecht: D. Reidel Publishing Company.

Clark, B.D. 1984. "Environmental Impact Assessment (EIA): Scope and Objectives." In Perspectives on Environmental Impact Assessment, ed. B.D. Clark et al. pp. 3-13. Dordrecht: D. Reidel Publishing Company.

Clark, W.C. 1986. "The Cumulative Impacts of Human Activities on the Atmosphere" In Cumulative Environmental Effects: A Binational Perspective. pp. 113-123. Hull: Canadian Environmental Assessment Research Council.

Clary, D.A. 1986. Timber and the Forest Service. Kansas: University of Kansas Press.

Connor, J. Chairman. 1984. Report of the Nova Scotia Royal Commission on Forestry. Halifax: Government of Nova Scotia.

Conover, S.A.M., Strong, K.W. et al. 1985a. "An Evolving Framework For Environmental Impact Analysis. I. Methods." Journal of Environmental Management 21(4):343-358.

——. 1985b. "An Evolving Framework For Environmental Impact Analysis. II. Applications." Journal of Environmental Management 21(4): 359-374.

Dayton, P.K. 1986. "Cumulative Impacts in the Marine Realm" In Cumulative Environmental Effects: A Binational Perspective. 79-84. Hull: Canadian Environmental Assessment Research Council.

Dickert, T,G., and Tuttle, A.E. 1985. "Cumulative Impact Assessment in Environmental Planning. A Coastal Wetland Watershed Example." Environmental Impact Assessment Review 5(1):37-64.

Dorney, R.S. 1989. The Professional Practice of Environmental Management. New York: Springer Verlag.

——. 1985. "Predicting Environmental Impacts of Land-Use Development Projects." In Environmental Impact Assessment: The Canadian Experience, eds. J.B.R. Whitney and V.W. MacLaren. pp. 135-149. Toronto: Institute for Environmental Studies.

Duinker, P.N. 1989. "Ecological Effects Monitoring in Environmental Impact Assessment: What Can It Accomplish?" Environmental Management 13(6):797-805.

——. 1985. "Biological Impact Forecasting in Environmental Assessment." In Environmental Impact Assessment: The Canadian Experience, eds. J.B.R. Whitney and V.W. MacLaren. pp.115-127. Toronto: Institute for Environmental Studies.

Duinker, P.N., and Baskerville, G.L. 1986. "A Systematic Approach to Forecasting in Environmental Impact Assessment." Journal of Environmental Management 23:271-290.

Duinker, P.N., and Beanlands, G.E. 1986. "The Significance of Environmental Impacts: An Exploration of the Concept." Environmental Management 10(1):1-10.

Dunster, J.A., and Gibson, R.B. 1989. Forestry and Assessment. Development of the Class Environmental Assessment for Timber Management in Ontario. Toronto: Canadian Institute for Environmental Law and Policy.

Elkin, T.J. 1987a. Municipal State of the Environment Reports: A Case Study. Ph.D. Dissertation, School of Urban and Regional Planning, University of Waterloo.

——. 1987b. State of the Environment Report, Regional Municipality of Waterloo. Working Paper 23. Waterloo: School of Urban and Regional Planning, University of Waterloo.

Enk, G. 1980. "The EIS as an Instrument of Social Change." EIA Review 1(3):224-227.

Environment Canada 1986. State of the Environment Report for Canada. Ottawa: Ministry of Supply and Services.

Erckmann, W.J. 1986. "Commentary II" In Cumulative Environmental Effects: A Binational Perspective. pp.19-21. Hull: Canadian Environmental Assessment Research Council.

Erickson, P.A. 1979. Environmental Impact Assessment: Principles and Applications. New York: Academic Press.

ESSA Environmental and Social Systems Analysts Ltd. 1982. Review and Evaluation of Adaptive Assessment and Management. Vancouver: Environment Canada.

Fairfax, S.K. 1978. "A Disaster in the Environmental Movement." Science 199(4330):743-748.

Forester, J. 1982. "Understanding Planning and Practice: An Empirical, Practical and Normative Account." Journal of Planning Education and Research 1(Winter):59-60.

———. 1980. "How Much Does the Environmental Review Planner Do?" EIA Review 1(2):104-107.

Geppert, R.R., et al. eds. 1985. Cumulative Effects of Forest Practices on the Environment: A State of the Knowledge. Olympia, Washington: Ecosystems Inc.

Ghiselin, J. 1982. "Reaching Environmental Decisions: Making Subjective and Objective Judgements." Environmental Management 6(2):103-108.

Gibson, R.B. 1988. Lessons of a Legislated Process: Twelve Years of Experience With Ontario's Environmental Assessment Act. Paper presented at the Annual meeting of the International Association for Impact Assessment, Brisbane, Australia, July 5-9, 1988.

Hartman, G.F. ed. 1983. Proceedings of the Carnation Creek Workshop: A Ten Year Review. Vancouver: Department of Fisheries and Oceans.

Hilborn, R., and Walters, C.J. 1981. "Pitfalls of Environmental Baseline and Process Studies." EIA Review 2(3):265-278.

Hinson, J.M. 1990. "National Forest Planning: A Timber Industry Perspective." Western Wildlands 15(4):23-27.

Hollick, M. 1981. "The Role of Qualitative Decision Making Methods in Environmental Impact Assessment." Journal of Environmental Management 12(1):65-78.

———. 1984. "Who Should Prepare Environmental Impact Assessments?" Environmental Management 8(3):191-196.

———. 1986. "Environmental Impact Assessment: An International Evaluation." Environmental Management 10(2):157-178.

Hyman, E.L., and Stiftel, B. 1988. Combining Facts and Values in Environmental Impact Assessment. Theories and Techniques. Boulder: Westview Press.

Jones, M.L., and Greig, L.A. 1985. "Adaptive Environmental Assessment and Management: A New Approach to Environmental Impact Assessment." In New Directions in Environmental Impact Assessment in Canada. eds. V.W. MacLaren and J.B. Whitney, pp.21-42. Toronto: Methuen.

Kimmins, J.P. 1987. Forest Ecology. New York: MacMillan.

Krawetz, N.M., MacDonald, W.R., and Nichols, P. 1987. A Framework for Effective Monitoring. Hull: Canadian Environmental Assessment Research Council.

Ministry of Forests. 1984. Forest and Range Resource Analysis. Victoria: Queen's Printer.

Morgan, R.K. 1983. "The Evolution of Environmental Impact Assessment in New Zealand." Journal of Environmental Management 16(2):139-152.

Munn, R.E. ed. 1979. Environmental Impact Assessment. Principles and Procedures. 2nd ed. Chichester: John Wiley & Sons.

Munro, D.A. 1986. "Environmental Impact Assessment as an Element of Environmental Management." In Cumulative Environmental Effects: A Binational Perspective. 25-30. Hull: Canadian Environmental Assessment Research Council.

Munro, D.A., Bryant, J.J., and Matte-Baker, A. 1986. Learning From Experience: A State-of-the-Art Review and Evaluation of Environmental Impact Assessment Audits. Hull: Canadian Environmental Assessment Research Council.

Murphy, M.J., and Stern, C.D. 1982. "An Internal Environmental Audit Can Help Firms Navigate the Stormy Seas of Regulation." Risk Management Magazine Reprint, (November).

National Environmental Policy Act. 1970. 42 U.S.C. 4332.

Ontario Ministry of Environment. 1981. General Guidelines for the Preparation of Environmental Assessments. 2nd Edition. Toronto: Environmental Approvals Branch, MOE.

Ontario Ministry of Natural Resources. 1987. Class Environmental Assessment for Timber Management on Crown Lands in Ontario. Toronto: MNR.

———. 1986. Timber Management Planning Manual for Crown Lands in Ontario. Toronto: MNR.

Orians, G.H. 1986. "Cumulative Effects: Setting the Stage." In: Cumulative Effects Assessment: A Binational Perspective. 1-6. Hull: Canadian Environmental Assessment Research Council.

O'Riordan, T. 1982. "US Experience in EIA - Lessons for Britain." Ecos 3(3):2-5.

O'Toole, R. 1988. Reforming the Forest Service. Washington, D.C.: Island Press.

Park, C. 1982. "EIA-Scope and Significance." Ecos 3(3):2-5.

Pearse, P.H. 1976. Timber Rights and Forest Policy. Victoria: Queen's Printer.

Peterson, E.B., Chan, Y.-H, Peterson, N.M., Constable, G.A., Caton, R.B., Davis, C.S., Wallace, R.R., and Yarronton, G.A. 1987. Cumulative Effects Assessment in Canada: An Agenda For Action and Research. Hull: Canadian Environmental Assessment Research Council.

Poole, C.F. Chairman. 1981. Royal Commission on Forest Protection and Management. Part 1, February. Part 2, November. St. John's: Government of Newfoundland and Labrador.

Porter, C. 1988. "Environmental Impact Assessment." In Environmental Practice in Australia. ed. T. Hundloe and R. Neumann, pp.72-81. Brisbane: Environmental Institute of Australia, Giffith University.

Province of Ontario. 1975. Environmental Assessment Act. Revised Statutes of Ontario, ch 140. Toronto: Queen's Printer.

Randolph, J. 1987. "Comparison of Approaches to Public Lands Planning: U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service and Bureau of Land Management." Trends 24(2): 36-45.

Rattie, C., Baskerville, G., and Duinker, P.N. 1987. "New Brunswick Forest Management" In Cumulative Effects Assessment: A Context For Further Research and Development. eds. N.C. Sonntag et al. pp.57-64. Hull: Canadian Environmental Assessment Research Council.

Renwick, W.H. 1988. "The Eclipse of NEPA as Environmental Policy." Environmental Management 12(3):267-272.

Rickson, R., Western, J., and Burdge, R. 1988. "Theoretical Bases of Social Impact Assessment." In Papers on Assessing the Social Impacts of Development. ed. R.A. Hindmarch, T.J. Hundloe, G.T. McDonald, and R.E. Rickson, pp.1-13. Brisbane: Institute for Applied Environmental Research, Griffith University.

Rosenburg, D.M., Resh, V.H., Balling, S.S., Barnby, M.A., Collins, J.N., Durkin, D.V., Flynn, T.S., Hart, D.D., Lamberti, G.A., McEbavy, E.P., Wood, I.R., Blank, T.E., Schultz, D.M., Marrin, D.L., and Price, D.G. 1981. "Recent Trends in Environmental Impact Assessment." Canadian Journal of Fisheries and Aquatic Sciences. 38(5):591-624.

Sample, V.A., and Kirby, P.C. 1983. National Forest Planning. A Conservationist's Guide. Washington, D.C.: The Wilderness Society.

Schindler, N. 1976. "The Impact Statement Boondoggle." Science 192(4239):509.

Schweitzer, D.L. 1987. "Forest Service Planning for the National Forests." Trends 24(2):7-12.

Shopley, J.B., and Fuggle, R.F. 1984. "A Comprehensive Review of Current Environmental Impact Assessment Methods and Techniques" Journal of Environmental Management 18(1):25-47.

Sonntag, N.C., Everitt, R.R., Rattie, L.P., Colnett, D.L., Wolf, C.P., Truett, J.C., Dorcey, A.H.J., and Holling, C.S. 1987. Cumulative Effects Assessment: A Context for Further Research and Development. Hull: Canadian Environmental Assessment Research Council.

Sonntag, N.C., Greig, L.A., Jones, M.L., McNamee, P.J., Baskerville, G., and Duinker, P. 1986. Pest Management in Plantations: A Consultative Approach. Vancouver: Environmental and Social Systems Analysis.

Stahl, A. 1990. "The Broken Promises of Forest Planning." Western Wildlands 15(4):28-31.

Storey, K. 1987. "Environmental Impact Assessment in Newfoundland: A Review." Operational Geographer 12:31-34.

Susskind, L.E. 1983. "The Uses of Negotiation and Mediation in Environmental Impact Assessment" In Integrated Impact Assessment. ed. F.A. Rossini and A.L. Porter. pp.154-167. Boulder, Colorado: Westview Press.

Truett, J.C. 1987. "US Experience in Cumulative Effects Assessment" In Cumulative Effects Assessment: A Context For Further Research and Development. eds. N.C. Sonntag et al. Hull: Canadian Environmental Assessment Research Council.

Tweeddale, R.E. 1974. Report of the Forest Resources Study. Fredericton: Government of New Brunswick.

United States Forest Service. 1987. Managing Competing and Unwanted Vegetation. Draft Environmental Impact Statement. Portland: USDA, Forest Service.

———. 1983. Scoping Guide. Washington, D.C.:USDA, Forest Service.

Walters, C. 1986. Adaptive Management of Renewable Resources. New York: MacMillan.

Ward, D.V. 1978. Biological Environmental Impact Studies: Theory and Methods. New York: Academic Press.

Wenner, L.N. 1984. Issues in Social Impact Analysis: Interagency Symposium Proceedings. Environmental Coordination. Washington, D.C.: USDA, Forest Service.

———. 1985. Social Science Information and Resource Management: Interagency Symposium Proceedings. Environmental Coordination. Washington, D.C.: USDA, Forest Service.

Wilkinson, C.F., and Anderson, H.M. 1987. Land and Resource Planning in the National Forests. Washington, D.C.: Island Press.

Wilson, L. 1980. "Piggybacking: A Successful Approach to EIS Preparation" EIA Review 1(2):196-199.

Wondolleck, J.M. 1988. Public Lands Conflict and Resolution. Managing National Forest Disputes. New York: Plenum Press.

Wright, D.S., and Greene, G.D. 1987. "An Environmental Impact Assessment Methodology for Major Resource Developments" Journal of Environmental Management 24(1):1-16.

Voogd, H. 1983. Multicriteria Evaluation for Urban and Regional Planning. London: Pion.

Von Moltke, K. 1984. "Impact Assessment in The United States and Europe" In Perspectives on Environmental Impact Assessment, ed. B.D. Clark et al. pp. 25-34. Dordrecht: D. Reidel Publishing Company.

Young, J.W.S. 1986. "Commentary II." In Cumulative Environmental Effects: A Binational Perspective. 145-148. Hull: Canadian Environmental Assessment Research Council.

MULTIPLE USE OF FOREST LANDS:

THE ROLE OF RANGELAND

by

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MULTIPLE USE OF FOREST LANDS: THE ROLE OF RANGELAND

INTRODUCTION

In the Province of British Columbia, the B.C. Ministry of Forests and Lands (hereafter Ministry) is responsible for the management not only of the timber resources but also the range resources found on public or crown land. The Ministry of Forests Act (1978), the Forest Act (1978) and the Range Act (1978) suggest that the Crown lands be managed for multiple use.[1] In the United States, as a result of federal legislation, such as the Federal Land Policy and Management Act (1976) and the Public Rangeland Improvement Act (1978), management of public lands in that country must satisfy both a sustained yield and a multiple-use mandate.[2] Sustained yield of range vegetation implies that periodic forage consumption by all uses be no greater than periodic growth as determined by government fiat; multiple-use management of public rangelands has been interpreted as a tradeoff that gives neither domestic livestock nor wildlife an exalted status over the other (Huffaker *et al.* 1990, p.74).

Recently in the United States there has been public pressure to abolish domestic grazing on public lands (see Quigley and Bartlett 1990; Godfrey and Pope 1990). The arguments for so doing are several: (i) the livestock sector benefitting from grazing on public lands is small relative to the rest of the sector, even in the western states; (ii) the beneficiaries tend to be part-time (hobby) farmers or farmers who obtain most of their receipts from other agricultural endeavours; (iii) the costs of providing public grazing services exceed the benefits; and (iv) other uses of the rangeland resources are substantially more valuable. The main factor favouring retention of grazing on public lands appears to be community viability, although there are other reasons as well. Given the situation in the U.S., it is likely that B.C. will likely encounter similar pressure on rangeland in the future. Given the importance of public range to the cattle sector of the B.C. economy, it is surprising that economic issues regarding management of public rangeland resources, particularly for multiple use, has received inadequate attention.

The current study provides a contribution to the multiple-use/abolition of public grazing debate. Its purpose is to examine economic efficiency and other economic aspects of multiple use as they relate to the management of public rangeland in the province of British Columbia. The study is divided into four sections. The next two sections provide background material, including definitions. The first of these provides a background to biophysical aspects. It includes a synopsis of the status of the province's rangeland resources and a review of biophysical studies of plant and animal interactions and ecological models of such interactions. The second background section focuses on economic issues related to the province's livestock sector and the role of public range.

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[1] Section 4(c) of the Ministry of Forests Act is the clearest statement in this regard. See also Duffy (1990).

[2] A number of court cases have reinforced the multiple-use mandate in the legislation (see Huffaker and Gardner 1987).

The economics of multiple use is the focus of the third section. Since biophysical aspects of resource use are an important component of economic analysis, these aspects also appear throughout the discussion. The major problem in implementing the economic models examined is lack of information and data concerning rangeland; however, the purpose here is simply to identify methods of analysis. Throughout the report, reference will be made to existing literature on range economics, obviating the need for a separate literature review. The final section presents conclusions and recommendations.

Finally, the focus of the current study is on rangelands, *but* the techniques that are discussed, particularly in the section pertaining to the economics of multiple use are relevant to the broader issue of land use conflict and multiple use of public forest lands. The approach to multiple use discussed here is not considered in any of the other background studies. Nonetheless, it is this approach to multiple use that is relevant to making economically efficient allocative decisions regarding land uses. Determining optimal tradeoffs among land resource uses is also important for cost-benefit analysis in the context of managing public forest lands.

BACKGROUND TO RANGELAND RESOURCES

This study begins by defining the bioeconomic unit of measurement describing use of rangeland resources, namely, the animal unit month (AUM). An AUM is the amount of feed or range services required to maintain a 1,000-pound cow or its equivalent for a period of one month. An alternative definition is that it is the amount of pasture services required to support a cow and her calf for one month; nursing calves less than 4 months old exert little pressure on the forage resource (Workman 1986, p.180).

Cattle equivalents are defined in terms of 100-lb. units or 0.1 AUM. Thus, the forage requirements of a domestic sheep are considered to be equivalent to 0.2-0.25 AUM and those of a horse to 0.15 AUM per 100 lbs. The general formula for converting the forage requirements of other animals is (see Workman 1986, pp. 149-50):

$$W^{0.75}/AU^{0.75} = (W/AU)^{3/4},$$

where W is the weight (in lbs.) of the animal in question and AU refers to a 1,000-lb. cow. However, in converting wildlife forage requirements (e.g., elk) to AUM equivalents, it is necessary to keep in mind that the conversion formula assumes similar foraging habits, which is obviously not the case (Pitt 1982). Some animals are grazers and some are browsers, while others are mixed feeders. Nutrient requirements and comparison of AUMs cannot truly be represented by the foregoing formula; not only do feeding requirements and habits vary by species, for example, but according to the breed of cattle. This makes it difficult to evaluate use of rangeland by wildlife in AUM equivalents.

Research indicates that, on average, about 300 kg of available forage is required to support one AUM (Nordstrom 1984, p.54). A very rough rule of thumb for determining the amount of grazing to permit on grasslands is to estimate the total forage yield, allow a 45% carryover to avoid damage to the range, and divide the remaining forage by the requirements of one AUM. It is not clear, however, if this rule holds for forest range (e.g., clearcuts).

Multiple use of forest lands for timber production and grazing has the potential to enhance allocative or economic efficiency of land use. However, a "major area of disagreement concerns the effect of grass and grazing on conifer regeneration in transitory range such as clearcuts and burns, as well as loss of forage production and summer grazing areas due to single-purpose logging and silvicultural practices" (Nordstrom 1984, p.1). While economic efficiency and other aspects of multiple use are the topic of a later section, in this section the conflict between grazing and timber production is examined primarily from a biological perspective. The discussion proceeds by providing a brief summary of B.C.'s rangeland inventory.

Rangeland Resources in British Columbia

There are approximately 8.5 million hectares of rangeland in B.C. administered by the government, with 90% utilized by cattle (95%), horses (4%) and sheep (1%) (Ministry of Forests 1989, p.11). Publicly-managed rangeland resources are important to the livestock industry of the province, providing approximately 1 million AUMs of forage to the ranch sector of the economy each year (Table 1). There are two important things to keep in mind about these figures. Firstly, there is evidence (discussed in a later section) that the public rangeland can support greater numbers of cattle simply by allocating the range more efficiently. Efficient allocation of range resources is important given that lack of range access is considered to be a substantial limitation to expansion of the industry (Talisman 1989). Secondly, effective utilization of rangeland tends to be concentrated in the southern part of the province, in the Caribou, Kamloops and Nelson forests, with some utilization in the Peace River region (Tables 1 & 2). The Kamloops Forest Region alone contains almost one-third of the provincial beef cow herd.

Rangeland in B.C. can be categorized in a variety of different ways. A simple method is to split all rangeland into two main categories--open range and forest range. Open range refers to land that is not used primarily for timber production and the successional and/or climax vegetation includes few large trees; the canopy cover is almost negligible. Open range is generally found in the southern interior (see Table 3), the result primarily of a drier climate that does not permit extensive forest growth. However, this need not always be the case since open range can also be the result of extensive clear cutting with no subsequent establishment of secondary forest growth. Forest range, on the other hand, consists of land that is currently forested or has been clearcut and is designated for commercial timber production. Forest range constitutes the largest component of the province's rangeland resources available for grazing, except in the Vancouver and Prince George forest regions (Table 4). Areas growing non-commercial timber are included in forest range, as are forest meadows, alpine and wetlands.

The Ministry of Forests (1980; 1984) attempts to provide more detailed inventories of rangelands, but this seems to be a difficult task. Definitions of what is to be included in the various categories of rangeland appear to change from one period to the next; there are a variety of different classifications of rangeland depending upon the purpose of the categorization (compare Tables 4 & 5); it is unclear how range classification and productivity are related to use; there is no effective and comprehensive inventory of provincial range resources; and monitoring of resources is lacking (Ministry of Forest 1989, pp.37, 59). The following categories of rangeland are defined by the Ministry of Forests (1984, pp.B39-B42).

1. Open range consists of a variety of grasses and forbs, with some old pine and fir present. Open range is generally located at elevations of 700 to 900 metres, divided into three elevations: lower, middle, and upper grasslands. Lower elevations are important for spring and fall livestock grazing, while middle and upper levels provide summer range. Precipitation tends to be low and production falls in the interval 550-1,120 kg of air-dry forage/ha; open range provides excellent grazing for both cattle and wildlife, and this interaction is a source of conflict, as discussed later. Information about the location and importance of open rangeland in B.C. is provided in Table 3. As noted, open range is important primarily in the southern interior--the Caribou, Kamloops and Nelson forest regions.

2. Wetlands provide excellent summer grazing when soil moisture is low enough to permit cattle. Productivity is about 1,500-4,000 kg of air-dry forage per hectare. This range type is particularly important in the Peace River (Prince George NE) region.

3. Alpine range is used primarily in late summer and can be fairly productive. It is found at upper elevations and can easily be degraded by overgrazing. (In Table 5, it is included in the "other" category.)

4. In the Ponderosa pine forest, water scarcity limits forage productivity and grasses dominate a poorly developed shrub layer. This range is used primarily for winter, early spring and late fall grazing. Although forage can be of high-quality, the range must be carefully managed to avoid degradation. This range type constitutes 0.1% of the area and a negligible amount of harvested AUMs. (In Table 5, it is included with the next category--Dry Forest range.)

5. Dry forest range is found primarily on stands of douglas-fir and lodgepole pine mix in the southern interior. The herb layer constitutes pine grass and associated forbs. This range is used mainly in the summer and produces an average of about 275 kg/ha of air-dry forage.

6. The Lodgepole pine range type is found extensively throughout the interior of B.C., particularly the central interior. It is used for summer grazing and can produce 550 kg of air-dry forage per ha at low stand density. Burning and thinning can be used to increase its productivity (see discussion below). It is on this type of range that there exists a great potential for conflict between wildlife and cattle.

7. Clearcuts in the wet forest constitute rangeland that is used extensively for summer grazing. Again there is a great deal of potential for wildlife/cattle conflicts due to competition for browse in denser lodgepole pine stands.

8. Deciduous forest/transitional range type is only used for cattle in the Peace River region. It is characterized by a rich understorey--herb and shrub layers are rich in nutrients--, sufficient water, and a productivity in the neighbourhood of 1,000 kg of air-dry forage/ha. This range type is generally used for community pastures (see Barichello 1978).

Transitional/brush and urban range types are also identified by the Ministry, but their characteristics are similar to one of the types described above, depending upon location. In addition to the distinction between open and forest rangelands described above, the Ministry aggregates categories 1, 4 and 5, plus clearcuts in the ponderosa pine and dry forests, into dry rangeland. Such range accounts for 47% of the forage utilized by livestock and 5.3% of the land area. Wetland, transitional/brush, clearing, and urban range types represent 15% of the land area and 38.1% of the AUMs harvested. A summary of the occurrence and importance of the various range categories in the province is provided in Table 5.

Possible conflicts between domestic livestock grazing and timber production on clearcuts are discussed in the next section. Clearcuts are transitional forest rangeland because they are in the process of becoming a commercial forest--transitional between old growth and second growth forest. The occurrence of this range type by forest region is described in Table 6. Unlike the U.S., there appears to be no range forage situation (range condition) report available for B.C. (see Joyce 1989).

Grazing/Timber Production Conflict on Forest Range[3]

In addition to recreational use and watershed functions, forestlands in B.C. can be used for wildlife and domestic grazing and timber production, although it is not clear to what extent one use (domestic grazing) interferes with the other (timber production). Forest rangeland can be considered to be either herb and shrub dominated (early successional forest) or tree dominated (late successional or climax forest). Forage production declines in going from the former to the latter, with perhaps the most decline in forage occurring when overstory cover reaches 20-30% (Nordstrom 1984, p.63). As illustrated in Table 7, the grazing productivity of forest range is substantially lower than that of clearcuts. However, forage productivity on forest lands is substantially higher than on open range, perhaps as high as 10 times (Quigley and Bartlett 1990, p.2).

When a forest is initially clearcut, seeding grasses is a silvicultural practice that can be used to initially stabilize the clearcut site and reduce soil erosion. By seeding appropriate domestic grasses or mixes of grasses, the site can provide good forage for cattle for a period of 15-20 years.[4] Studies in southern B.C. indicate that seeded lodgepole pine/Engelmann spruce clearcuts should be grazed for 3-4 months during the summer grazing season, with each pasture utilized for only 30 days. Based on this recommendation, 0.73 hectares of range will support one AUM, there is good pasture utilization (75-85%), and the range will produce about 60 kg of beef per ha per year (Nordstrom, p.49).

Seeding of domestic grasses is done either manually or aerially, but seedbed preparation (e.g., scarification) and fertilization is usually prescribed to get rid of undesirable, competitive vegetation and enhance range productivity (Nordstrom, pp.24-32). Although Nordstrom reports on a number of studies that have examined the effects of scarification, fertilization, plant varieties and grass mixes (pp.15-31), there is a conspicuous absence of economic feasibility studies.[5] The only studies of economic feasibility of seeding that the current author is aware of have been for open range in the U.S.. These studies indicate that, in some instances, it is feasible from a social standpoint to plow overgrazed public rangeland and seed it to more productive grass varieties (see Stevens and Godfrey 1972).

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[3] Much of the information in this section comes from Nordstrom (1984). This review should be consulted for additional detail and explanation.

[4] Nordstrom (p.49) cites an Oregon study indicating that the site could provide forage for as little as 6 years, but the majority of studies indicate the clearcut range will provide forage for the length of time indicated.

The primary use of clearcut forest land is commercial timber production. Although such land may be used for cattle, there is conflict between range and forest users over possible damage to tree seedlings by cattle. Research indicates that the potential for damage and the actual costs of such damage depend on whether or not the clearcut is seeded to domestic grasses, whether or not tree seedlings are planted, the tree species, the stocking rate, the presence of wildlife (e.g., big game, rodents), and so on. The evidence indicates that, with appropriate management, the damage to tree seedlings from domestic livestock is minimal. The damage that does occur is the result primarily of repeated trampling, and this occurs as a result of overgrazing or where cattle congregate. One strategy, therefore, is to employ appropriate management tactics (e.g., fencing, location of salt and water, and slash removal) to reduce damage. However, the costs and benefits of such strategies need to be studied. Another suggestion is that grazing be prevented until trees reach 2-3 meters in height, but this reduces the economic viability of seeding clearcuts for domestic cattle use.

While trampling is a problem, damage from other causes, such as browsing by game animals and rodent damage, may be greater (see Nordstrom 1984, pp.54-57). Further, domestic grazing can help in establishing a seedbed for tree seedlings and conifer release where natural regeneration is relied upon, and can be used as a method of natural and random thinning. Thus, it is possible that domestic grazing on clearcuts aids forest reproduction. While studies have focused on the interactions between forage, trees and livestock, there is little information about economic aspects of these multiple use interactions. Perhaps *economic losses to loggers resulting because cattle increase the time required to establish a second growth forest are more than compensated for by gains to livestock producers.*

In summary, as Quigley and Bartlett (1990) report, "recent research has demonstrated that livestock grazing has potential as a silvicultural tool. Grazing has been found to be an effective technique of brush control, seedbed preparation under timber stands, and as an effective technique to obtain income from timber land between harvest cycles" (p.2). The economics of livestock grazing and investments in forest range improvements need to be investigated further for B.C.

Investments in Range Improvements

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[5] Nordstrom does review economic studies of range management, but that review constitutes but a single page (p.70). However, he does list eight economic questions that need to be addressed if conflicts between forest and range users are to be resolved (p.71).

There are a number of management practices that can enhance the productivity of rangelands. Seeding of forest clearcuts to forages has already been mentioned. Although native forage is available on clearcuts, there are benefits to seeding domestic species. In addition to such benefits as erosion control, increased soil fertility and mitigation against weed invasion, seeding of domestic species increases productivity of the range for cattle (Nordstrom 1984, p.14).[6] However, there is little information concerning the biophysical aspects of seeding clearcuts (i.e., yields, competition among plants and tree seedlings, fate and persistence of seeded forages, rate of recolonization of native plants, etc.), let alone economic feasibility.

On forest lands that have not been denuded, management to improve forage for livestock consists of tree thinning and prescribed burning. While thinning is not economically feasible due to the expense of slash removal, the same is likely true for prescribed burning. However, there is little or no economic information about these management activities, although biophysical studies suggest that prescribed burning holds the most promise for Ponderosa pine range, for example.

Finally, there have been economic studies that examine the feasibility of cultivating open range and seeding domestic forage. These studies are the result primarily of efforts in the U.S. to restore range that had previously been overgrazed. Investments in range improvements via plowing and seeding, provision of inputs (water, fencing), and prescribed burning or chemical spraying to eliminate unproductive species have occurred primarily as a result of political factors. Although Congressional appropriations in the U.S. for range improvements require a cost-benefit analysis, this has not always been the case in practice. *Ex post* analysis of investments in range improvements near Vale, Oregon, for example, indicate that such investments were only marginally feasible (Stevens and Godfrey 1972). However, the rangelands chosen for improvement were considered to be less productive than alternative sites.

In summary, investments in range improvements can enhance the productivity of both forest and open rangelands. These investments include prescribed burning, seeding (with or without seedbed preparation), and physical structure (e.g., fencing). Along with herd management (location and duration of grazing), investments can increase the output of the livestock sector. Although studies of the biophysical interactions of these management techniques are ongoing, too little attention is given to their economic aspects. Economic analysis of rangeland investments indicate that some yield net benefits to society, but that others result in losses. It is important to identify range investments that are efficient, weeding out projects that are unable to cover society's costs, where the latter include the opportunity costs of other uses. It is also important to identify possibly profitable projects that have been overlooked.

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[6] One study of burn sites found that yields on seeded sites were 3,400 kg/ha compared to 1,300 kg/ha on sites left to regenerate on their own; undisturbed sites yielded about 500 kg/ha (Nordstrom 1984, p.49).

Forage/Cattle/Wildlife Interaction: Range Condition and Production Function

The interactions among vegetation (forage), domestic livestock and wildlife are important in the context of range management; they are also important considerations in economic models of multiple use of forest rangelands. In this section, these interactions are examined in greater detail.

Systems Modelling. The integration of all possible interactions in a systems model of rangelands and their management rarely occurs in practice, primarily due to difficulties in modelling such interactions. Nonetheless, simple models may be useful as an aid to policy makers as illustrated by Walters (1986). A possible systems model is provided in Figure 1, which is adapted from Starfield and Bleloch (1986, p.93). (These authors provide a model that includes vegetation and grazing by different species of wildlife in southern Africa.) The model is essentially comprised of three modules identified by rectangular boxes. Exogenous factors or management decisions are enclosed by an oval or circular line.

In Figure 1, biophysical factors such as precipitation, location, et cetera, are instrumental in determining the types of vegetation (species and competition), and the quantity and quality of vegetation, that is, the "range condition" (Dyksterhuis 1949). Range condition is also affected by grazing and human intervention (viz., range investments), as indicated below. In order to simulate the herbivory, it is necessary to identify the various herbivores that use the range, the plants they eat, the amounts eaten, the interactions among herbivores, and so on. Based on this information, population growth over time for cattle, elk and other users are constructed. Population growth minus harvests over time have a feedback effect on future vegetation and range condition, as do range investment and stocking decisions and exogenous biophysical factors.

Development and implementation of a systems model is beyond the scope of the current study. It is a research task that requires interdisciplinary cooperation among specialists in a number of fields. Given the nature of rangelands, models will need to be site specific, and will likely need to account for movement of animals (both domestic and wildlife) between regions. Simple systems have been constructed by some researchers (e.g., Huffaker and Wilen 1989), but these tend to be rather esoteric, appealing to mathematical modellers, because data are generally unavailable.

Production Relations. *Utilization* of the range by cattle is a function of the relative palatability and availability of forage. The presence of slash from logging operations significantly lowers utilization, for example, although slash helps to control erosion. The mix of domestic and native forages, and the types of domestic forages that are seeded, affect utilization.

It is possible that the production of forage on the range is increased as a result of efficient allocation of use rates and planting of grasses that increase in productivity when they are grazed. "The term 'range condition trend' refers to the direction of change in forage composition and productivity on a range site, normally in response to grazing" (Nordstrom 1984, p.52). Competition from native herbs and shrubs leads to a downward trend in range condition unrelated to livestock utilization, while grazing may result in an upward or downward trend in range condition.

Dyksterhuis (1949) identifies three types of vegetation according to their impact on range condition: decreasers, increasers and invaders. The decreasers and increasers are "species of undisturbed and relatively stable or climax plant communities, whereas invaders are not" (p.108). The decreasers and increasers are grasses and forbs that are palatable to herbivores, although palatability varies from one species to the next. Although it depends upon location, an example of an increaser is Sandberg bluegrass, while bluebunch wheatgrass is an example of a decreaser, a native forage that declines as it is grazed by cattle (Anderson 1962, p.247). Knapweed is likely the most problematic of the invaders, at least in B.C. However, from the perspective of the rangeland resource, trees are also a major invader (although loggers are unlikely to think of trees as an invader species).

The relation between decreasers, increasers and invaders provides a quantitative measure of range condition (Dyksterhuis 1949) as illustrated in Figure 2. As the range is grazed, the more palatable decreasers begin to decline, but increasers are able to expand their cover. However, as the availability of decreasers declines and increasers are utilized to a larger extent, they also begin to decline, thereby permitting invaders to overtake the range. Dyksterhuis identifies overgrazing as the main cause of depletion of the range resource. In 1986, 18% of BLM rangeland was considered to be in poor condition, while 35% was in good or better (excellent) range condition; 20% of Forest Service rangeland was thought to be in an "unsatisfactory management state" (Joyce 1989).[7]

Production functions for a range are indicated in Figure 3. Rather than constituting a "single-line" frontier as is typical in production economics theory, the vegetation production function is a thick curve. The upper line (A) represents conditions where forage plants are vigorous, while the lower line (B) represents the average lowest yield recorded for the range condition--low-vigour forage plants (Anderson 1962, p.246). Vigour is affected not only by weather, but also by grazing and range investments (e.g., burning and fertilization). If vigour is related primarily to the stocking rate, then one can consider the upper line to represent the case where the stocking rate permits the range to recover, while the lower line represents overgrazing. In the former case, it is possible (perhaps with other investment) to improve the range, while, in the latter case, range condition trend is negative. This is indicated by the directional arrows on lines A and B in Figure 3.

Utilization and carrying capacity of the range are also illustrated with an example in

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[7] As reported by Quigley and Bartlett (1990).

Figure 3.[8] Domestic cattle and antelope are assumed to graze on the range in question. Since each animal prefers a different species of plant, utilization and carrying capacity for cattle and antelope vary with range condition as indicated at the bottom of the diagram. The bottom rows in the diagram provide some information regarding the tradeoff between domestic and wildlife grazing, information that is important in deciding optimal multiple use of rangelands, as discussed in a later section.

McKelvey (1980) develops a dynamic mathematical model to analyze the interaction among vegetation, domestic cattle and wildlife grazing, and the effect of stocking rate (harvest of vegetation) decisions on the dynamics of the system. Such analytical models are particularly helpful in identifying possible systems instability and critical levels where economic irreversibility occurs, although economic considerations are often ignored in these types of ecological models. Further research is required in B.C. to identify at least the range of values where critical interaction occurs, particularly with reference to the knapweed problem, and the costs and benefits of maintaining a safe minimum standard (see Ciriacy-Wantrup 1968, pp.253-68).

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[8] The example is for Texas (McKelvey 1980).

BACKGROUND TO RANGELAND MANAGEMENT

For the purposes of the current study, it is useful to clarify what is meant by the terms *range management* and *range economics*, that are often used to describe the same notion. There are some who make a distinction between ranch economics, range management and range economics. Workman (1986) suggests that *ranch economics*, which has been practised since the 1870s, refers only to the application of economics to ranch management decisions (p.2). As a discipline, Workman argues, *range management*, which did not appear until around 1910-1920, deals with questions of "will it work"--the biological questions. *Range economics* is considered, by Workman, to be a subdiscipline of range management because it deals with questions of "will it pay"--the financial questions. Unfortunately, this taxonomy is misleading and results in jurisdictional disputes that could hamper efficient allocation of range resources. As conceived by the current author, economics is a subject with a broader scope than that implied by Workman.

Rather than employing Workman's taxonomy, the following is adopted. *Ranch economics* and private range management are synonymous and a subdiscipline of farm management; the term farm management is preferred because it refers to a well-known body of literature and tools of analysis. Farm management concerns private evaluation of on-farm resource allocation and marketing decisions, subject to both institutional and biophysical constraints. This is why farm management is often considered a subset of production economics. As indicated below, tools of production economics are useful in analyzing multiple land use.

Since questions concerning "will it pay" cannot be separated from those dealing with "will it work", it is clear that the economic consequences of range management decisions cannot be separated from biophysical ones. The biophysical constraints constitute the production function of economics--the tradeoff function among competing land uses. Therefore, range economics cannot be practised without input from biologists, and biologists cannot make efficient management decisions without input from economists (Nelson 1983, p.41). As a result, range economics and range management are the same thing, a subset of natural resource economics or, perhaps more appropriately, a subset of ecological economics (Costanza 1989). The terms are used interchangeably in the current discussion.[9]

Role of Public Range in Cattle Operations

Cattle operators can be divided into four categories: cow-calf, cow-yearling, background and finishing. Cow-calf and cow-yearling operators have a substantial investment in a cow herd which generally includes one steer for every 20 cows. Steers are replaced every three years.

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[9] In his historical overview of range legislation and research, Gray (1983) makes no distinction between ranch economics, range economics and range management.

Approximately 80% of the cows give birth to calves which are born in the early spring (see Kearle and Hoye 1983, p.19). In the fall, 15% of the herd is generally culled and calves are sold, except for those to be used as replacement heifers. (For genetic reasons, replacement steers are always purchased.) A cow-yearling operator will keep the calves somewhat longer, selling them the following year as short or long yearlings depending upon whether they are sold in the spring or fall, respectively. Background operators have no investment in a cow herd but purchase calves in the fall for sale the following year. Finishing occurs in beef lots.

In B.C., cow-calf and cow-yearling operations dominate. These activities also rely most upon range resources. The B.C. livestock sector has traditionally been a supplier of feeder cattle to Alberta and other beef lots. The B.C. herd constitutes about 220,000 beef cows and 75,000 dairy cows, with an annual production of about 235,000 calves.

Cattle feeding can be divided into six periods per year, two of which are during the winter. For B.C., Graham and Borth (1988, p.285) employ the following feeding periods:

1. early spring (May 1 to May 31),
2. early summer (June 1 to July 15),
3. summer (July 16 to September 15),
4. fall (September 16 to November 30),
5. winter (December 1 to February 28), and
6. calving (March 1 to April 30).

The year can also be divided into monthly feeding periods or ones that differ from the above, but, practically speaking, these are a function of when calves are born and the availability of range and pasture lands (i.e., climate conditions). In general, range and pasture lands are not available during the winter and calving seasons, but cattle might be able to graze on public range and private pastures found at low elevations in southern regions.

The rancher has to make decisions concerning the allocation of his or her owned improved and unimproved lands subject to the availability of public range or community pastures.[10] Tenure requirements may also make the rancher responsible for allocation decisions on public range, subject to the Ministry's constraints.[11] Ranchers are given either grazing licenses, that provide some guarantee regarding long-term use of the range and require that they file management plans, or grazing permits, that are renewable but subject to periodic review. (To qualify for either a license or permit, producers must show that they can support their herd during periods when public forage is not available (Ministry of Forests 1989, pp.15-16).) In practice, permit renewals have been administered in a way that makes them almost indistinguishable from licenses, but the Ministry is not satisfied that licenses provide adequate long-term guarantees to commit producers to making range improvements (Ministry of Forests 1989, p.31). In the U.S., researchers have urged adoption of perpetual grazing rights since these provide incentives for sustained management of range vegetation (Quigley and Thomas 1989). Debate about these types of institutions is also taking place in B.C.[12]

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[10] Improved lands are those that have been seeded to pasture, tame hay, alfalfa or some other crop; unimproved lands are meadows and pastures with native grasses, forbs and browse that have generated naturally, wetlands, brush and waste lands, and forest lands.

[11] One problem of tenure concerns grazing on clearcuts where herds must be moved from one spot to the next. In this case, existing ranchers are preferred over entrants because herd behaviour has been established, making it easier to move herds and satisfy Ministry regulations.

The costs to the Ministry of managing the range resource and providing support services to the livestock sector is approximately $6.0 million per year (Ministry of Forests 1989, p.19). Given that almost 1 million AUMs of grazing occur on public lands and that the 1988 grazing fee was $1.75/AUM, revenues amount to about $1.75 million, or about 30% of costs. The Ministry proposed to increase the grazing fee to $2.30/AUM for 1989, thereby recovering approximately 38.5% of annual costs (Ministry of Forests 1989, p.18).[13] By arbitrarily attributing only half of the aforementioned costs to supporting the livestock sector with the remainder to other rangeland functions, the Ministry suggests that 60% or more of its costs are recovered.

Whether or not the industry is subsidized depends upon the actual market value of an AUM of grazing and the efficiency of providing the public services to the livestock producers. Basing charges on management costs is inappropriate from an economics standpoint since costs do not reflect values. In any event, it does appear that the livestock sector is receiving a subsidy, but it may only be comparable to that received by U.S. producers. Godfrey and Pope (1990, pp.6-7) estimate that, in 1983, the true opportunity cost of one AUM of grazing in the U.S. was $2.44. Even with the increase in BLM grazing fees for 1989, the fee would only be approximately $2 in U.S. funds.

Since cattle graze in areas where they come into conflict with wild animals, there is always potential for conflict. In some cases, cattle are lost due to predation, although this seems to be a minor problem. A second and greater problem concerns what Pitt (1982) has termed *homesteader* elk. These are big game animals (elk) that feed on private feedstocks along side cattle during the winter months. This imposes an external cost on the rancher since he or she is not able to capture the benefits associated with the maintenance of the elk. However, this problem is easy to overcome with compensatory payments from hunters or the government to ranchers. The same is true if predation is a problem: to prevent ranchers from trapping and killing predators, the government may need to make payments to ranchers.

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[12] The Ministry argues that permits need to be converted to licenses, and licenses have to be made more flexible so that they confer more rights to producers. Indeed, the Range Program Review recommends that the Range Act be rewritten as soon as possible (p.31).

[13] The BLM grazing fee was set at $Cdn1.84/AUM in 1988, with a proposed increase of 25% for 1989; this is the maximum allowed under the U.S. Public Range Improvement Act (1978).

Finally, there are problems associated with the enforcement of range regulations. Cattle often graze beyond the period permitted by the Ministry. Commercial outfitters and guides frequently use public range resources (for grazing by horses during recreational trips and at other times) without paying for them, as required by the Range Act. These are problems related to the development of appropriate instruments for collecting forage fees, development of appropriate and effective penalties, and simply enforcement.

Effects of Domestic Grazing on Public Range and Administered Prices

Grazing rights on public rangelands and the fees charged to ranchers are not determined in the market place; public grazing fees are an example of administered prices. In Canada and the United States, public agencies determine both the amount of domestic livestock that can be grazed, to whom grazing rights are given, and the amount that needs to be paid to graze animals. The government agency responsible for rangeland management also makes decisions concerning range improvements.

The effect of grazing on crown rangelands and the impact of administered prices (grazing fees) can be illustrated via Figure 4. In the figure, the derived demand for range and pasture services is assumed to have the usual negative slope. Although final output price (price of beef) is a parameter to the individual beef producer, it is likely that some of the inputs into production will have finite supply elasticities, thereby giving rise to the negative slope.

The supply of private foraging services (S_{Pr}) is upward sloping because sources of supply can be ordered according to their basic unit costs: unimproved land with little alternative use owned by the farmer, pasture land rented from other private owners, and improved land on the farmer's own property which can be used for hay or grain production (see Barichello 1978, p.29). The supply of public rangeland (S_R) is determined by public agency fiat and, therefore, is assumed to be totally inelastic at the number of AUMs of public grazing made available by the government agency.

The impact of public grazing is illustrated in Figure 4. Given that there is a public supply of rangeland services (measured in AUMs) of amount q_2q_1 (=0R), the supply of grazing services is given by $S_{Pr}+S_R$ and the net amount of grazing services resulting from public provision of rangeland is given by q_0q_1, with the actual amount depending on the elasticities of supply and demand.[14] The benefits of grazing on public rangeland are the results of two effects. (1) There is an increase in the benefits accruing to cattle producers because the price of private range/pasture services has fallen from P_0 to P_1. This increase in benefits is measured by the area under the demand function, namely, bcq_1q_0. (2) An amount q_2q_0 of range/pasture services is released for use in its best alternative. In the current situation, there is a shift of grazing from own pasture land to public range. The freed pasture land can be used to produce hay or other crops (e.g., barley) that can be fed to the cattle during the winter months. This benefit is measured by the area abq_0q_2.

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[14] If N is the increase in total range and pasture consumption as a proportion of the amount of public range made available ($N = q_0q_1/q_1q_2$), then N = Ed/(Es+Ed), where Es is the elasticity of supply and Ed is the elasticity of demand (Barichello 1978, p.29).

The private users of the public range (i.e., cattle ranchers) pay a grazing fee (g_f) that is administered and likely below the market price. There are several reasons why the grazing fee might be below the market price, including: (1) the agency does not know what impact provision of public range has on market prices (i.e., P_1 versus P_0); (2) the opportunity costs of providing public range are negligible, a result of normal forest harvesting and administrative activities; and (3) the administered price structure is an institutional arrangement that has bestowed historic property rights upon cattle ranchers. These historic rights or benefits are capitalized in ranch values and withdrawal of them, now or in the future, will require some form of compensation (Obermiller 1982).

In terms of Figure 4, ranchers pay a price of P_1 for $0q_2$ AUMs of grazing services and g_f for the remaining q_2q_1 AUMs. Thus, the net benefits to cattle ranchers from public grazing are given by area eabcd in Figure 4. Net social benefits are less than net private benefits by the amount that the per AUM cost of providing public grazing services exceeds g_f multiplied by OR.

Whenever cattle are shifted from private pasture to public range during the spring, summer and fall grazing periods, a constraint upon cattle numbers is relaxed. The private pasture can now be used to produce hay, forages or other feed that can be used in the winter months. Thus, an increase in grazing permits on public range will make private lands more productive and ranchers better off. Access to public grazing thus becomes capitalized in ranch values. The capital value is given by area eabcd divided by the private discount rate, which includes a risk component.

Often the public agency is faced with decisions regarding *marginal* changes in AUs of grazing on public rangeland. Perhaps the decision is whether or not to make a particular range improvement or whether to reduce domestic grazing so that more is available for wildlife. Since changes are marginal, the total benefits of an increase (costs of a reduction) in public grazing can be approximated by the market price of an AUM of grazing times the number of AUMs made available by the program (decision). Again, the net private benefit of (loss due to) such a decision is given by the change in AUMs times the difference between the market price and g_f. However, if the changes in the availability of rangeland grazing are nonmarginal, then an analysis similar to that of Figure 4 is required. In this case, however, the amount 0R is considered to be the change (increase or decrease) in grazing on public range rather than the total grazing available on public rangeland.

The difficulty in the foregoing analysis is that of determining the costs of providing public rangeland. The costs of providing this range are not incurred by the private operators but accrue to the Ministry. These social costs are difficult to measure and may even be negligible in the case where excess capacity exists or where the public range was previously poorly managed (see Graham and Borth 1988). The costs of providing increased grazing on public lands likely consist of two components. Firstly, the Ministry may incur expenses as a result of providing increased grazing on rangelands. These costs include increased administration costs and, perhaps, outlays for range improvement. In any case, these costs can be measured.

A more difficult component of costs involves alternative uses of the range, including primarily reductions in nutrient availability to wildlife. A reduction in wildlife numbers implies a reduction in the welfares of hunters as well as those of preservationists, sightseers and so on. If the range is to be managed in a way that maximizes the total welfare of society, and not just that of one group in society, it needs to be managed for multiple use. In the next section, the issue of multiple use on rangelands is examined in greater detail.

Finally, there is the problem of setting grazing fees. Efficient fees can determined by means of auctions or bids. While the Ministry indicates that actual grazing rights may be worth $1.50-39.50/AUM, depending upon range condition, access distance, and so on, it argues that auctions are not practicable on the basis of equity and political acceptability (Ministry of Forests 1989, p.60). While these are real concerns and are discussed in the next section, there may be local monopsony or monopsonistic competition that mitigates against an efficient solution via such a mechanism. An example of this is preferred desirable behaviour by established herds. Appropriate fee setting is a difficult and politically dangerous task, but the best way to move toward economic efficiency is by charging variable fees depending upon, e.g., regional climatic and productivity factors, season of use, distance to access, species of livestock and, perhaps, breed of animals. Any modifications to the current system, however, must take into account both fairness and political acceptability.

MULTIPLE AND CONFLICTING USES OF FOREST RANGELAND

Forest range has a number of potential uses that cannot be ignored in decisions concerning optimal use. In addition to logging and domestic grazing, such lands have usefulness in activities that are either not measurable in the market place or are measurable only with great difficulty. A recent survey of U.S. Forest Service employees by Quigley (1989) found that they considered domestic grazing to contribute 10% of total value associated with multiple use of forest lands, timber 15%, water 25%, recreation 25% and wildlife 25%. None of these values is insignificant, indicating that multiple use management is an important consideration in valuing forest lands. Although studies of multiple use management focus on interactions between timber, domestic grazing and wildlife grazing, it is important not to ignore other uses of rangelands. Issues of concern include such things as conflicts between recreationalists and domestic grazing, destruction of riparian habitat and deteriorating water quality resulting from cattle congregating near streams, and existence (preservation or nonuse) values for both unspoiled environments and wildlife.

In British Columbia, section 4(c) of the Ministry of Forests Act requires that integrated resources planning occur on forest lands, and section 4(b) requires that the resources be managed in such a fashion "having regard to the immediate and long term economic and social benefits they may confer on the province". However, "the presumption is that timber production is by far the most valuable use and that only minor adjustments in the timber harvesting plan should be made to serve wildlife, outdoor recreation, wilderness, fisheries, and water supply demands" (Fox 1990, p.12). Likewise, because the Ministry's focus is on timber resources, it appears that range resources have been neglected and, consequently, may have been inefficiently managed (Graham and Borth 1988). This may be true particularly when considering the potential for multiple use management.

Fox (1990) identifies three steps in order to manage forest lands in a way that maximizes the net benefits from the resource. (1) It is important to determine the net benefits from utilizing land for each possible use on a sustainable basis in the absence of interference from any other use. (2) It is necessary to identify conflicts among different uses and their economic significance. (3) Finally, combinations of uses must be examined in an iterative fashion so that the mix of uses that maximizes the net benefits of the land can be identified. That is, "each use is accommodated to the extent that the marginal benefit of that use equals the marginal cost imposed upon other uses" (Fox 1990, p.13). This is the economic efficiency criterion of multiple use.

Economic efficiency is only one of several criteria that can be used to evaluate multiple use for policy making.[15] In this study, the following four criteria are considered:

- economic efficiency,

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[15] For example, the Ministry of Forests Act also considers the "social benefits". While this term has a vague meaning, an attempt to provide substance to it is provided below.

- income distribution,
- fairness, and
- political acceptability and operational practicality.

The income distribution criterion refers primarily to local (e.g., county-level) economic impacts: range management decisions have an impact on regional income redistribution that cannot be ignored. Such issues are often analyzed using tools of input-output analysis. Fairness and political acceptability/operational practicality are similar and will be dealt with in the same section. The former refers to such things as historic rights of access to range forage and access to range by hunters; the latter refers to society's concern with sustainable development (e.g., maintenance of range productivity), acceptability of range management policies, *et cetera*. Perhaps, to be included with political acceptability is operational practicality. This refers to the feasibility of making decisions regarding multiple use in the field; regional managers often rely on rules of thumb and intuition when making decisions. Each of the aforementioned criteria will be discussed in the sections that follow.

Economic Efficiency and Multiple Use: Static Analysis

Transformation Functions for Alternative Land Uses

Prior to the 1920s, much of the southern Rocky Mountain Trench was covered with forests. As a result of intensive logging at lower elevations (to supply a growing Prairie economy) and subsequent fires during and shortly after the decade, large rangeland areas became available for domestic and wildlife grazing. As a result, populations of whitetail and mule deer, elk and bighorn sheep reached their peaks in the East Kootenay Region during the 1950s. During the next 30 years, however, wildlife populations declined, partly as a result of overharvesting, but also because range resources were limited (see Pitt 1982, pp.5-6).

Rangeland resources in the East Kootenays experience constraints that arise from multiple use. Forest succession and ingrowth, combined with fire suppression, have reduced the available rangeland, thereby exacerbating conflicts for forages between domestic cattle and wildlife. Since 1975, the Coordinated Resource Management Planning (CRMP) in the East Kootenays, with funding from federal-provincial agricultural programs,[16] has increased the availability of forages on public rangelands. However, in the East Kootenays, there remains conflict (1) between those who wish to increase cattle numbers and those who desire increased use of the range by wildlife; (2) between those advocating the land be used for timber production and those favouring range; and (3) between the aforementioned groups and those who would promote some form of suburban development (see Pitt 1982). To a greater or lesser degree, similar conflicts among commercial timber, wildlife, ranching and other interests characterize rangeland conflicts in all areas of the province. In this section, the focus is primarily on conflicts between domestic and wildlife grazing, but the economic techniques described can be used to evaluate other land use conflicts as well. Biophysical aspects of the interactions among uses were discussed in the preceding sections, although further reference to such aspects will be made in the following discussion as needed.

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[16] The Agriculture and Rural Development Agreements between the federal and provincial governments provide for cost sharing of range improvements--45% by each of the two levels of government and 10% by agricultural producers.

The various land uses can be considered outputs produced by the land resource. Alternative land uses are (1) competitive, (2) complementary, (3) supplementary, or (4) antagonistic (Workman 1986, p.103). Competitive and complementary land uses can be discussed with the aid of Figure 5. Competitive products are those for which an increase in utilization of the land for one use results in a decrease in the output from the other use. When products are complementary in their use of the land this implies that an increase in utilization by one use actually increases the amount of product available from the other use.

In Figure 5, suppose that land use #1 refers to domestic grazing by cattle, while use #2 refers to grazing by deer. If the rangeland is used only by domestic animals, the number of AUMs that can be supported is given by 0H. If the land is utilized only by deer, then the carrying capacity of the range is 0G. When cattle are introduced onto a range that is currently used only by deer, there may be an increase in the number of deer that can be supported by the range. By grazing cattle, more winter range becomes available for deer because the cattle prefer grasses and forbs that compete with shrubs and other plants preferred by a browser. By grazing cattle, the shrubs grow better, providing more forage for deer. Likewise, if the range is currently used by cattle, introducing deer will increase the carrying capacity of the range for cattle. In both cases, there is complementarity in land uses that is illustrated by the segments GF and HK in Figure 5. Thus, at moderate stocking levels and with proper management, the interaction between deer and cattle can be mutually beneficial.[17]

However, at higher stocking levels, complementarity gives way to competition for the range. Competitive use implies that there is substitution between the products available from the range and this substitution can be either constant or increasing. The case of increasing marginal

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[17] As another example of complementary land uses, sheep are sometimes grazed in reforested areas to reduce competition for trees (Ministry of Forests 1989, p.16). The sheep will eat the plants (mainly fireweed) that compete with trees in the early stages of tree growth. Nordstrom (1984, p.49) reports that an Oregon study found heifers gained 0.64 kg/day in a cattle-only enclosure, but 0.84 kg/day when elk and deer were permitted to browse with cattle; complementary interaction actually increased the forage available to cattle.

rates of substitution is indicated by the concave-to-the origin curvilinear segment FK in Figure 5. This indicates that, as more cattle are fed on the range, the number of deer that can no longer graze on that range increases--deer are displaced at an ever increasing rate. A constant rate of substitution implies that the rate at which deer are displaced by cattle is the same regardless of the number of cattle that graze on the range, up to the carrying capacity of the range for cattle.

The case of a constant rate of substitution is frequently postulated for the interaction between elk and cattle (e.g., Cory and Martin 1985). The reasons are twofold. Firstly, the most common conflict between domestic and wildlife grazing is between elk and cattle. Given a paucity of information about the actual shape of the biological tradeoff function, it is convenient to simply assume a straight forward substitution of some magnitude. For elk, the tradeoff in B.C. has been between 0.33 and 0.625 AUM per elk (Pitt 1982, p.48). A more recent estimate of the tradeoff suggests that it is 0.33 AUM/elk in the summer and 0.43 AUM/elk in the winter (Pitt 1990).[18] Secondly, there is evidence to suggest that elk and cattle do have similar foraging habitats, which permits a linear transformation function (Pitt 1982, p.48). Figure 6 illustrates the linear transformation function.

The case of supplementary outputs is a special case of complementarity where the output from one use is unaffected by the other use. Rather than an upward slope on the production possibility function, the tradeoff function is horizontal as indicated by the straight line segment GF in Figure 7. Suppose that, rather than deer or elk, use #2 refers to domestic sheep. The segment GF is horizontal because the two types of livestock prefer different plant species. At sufficiently low numbers of cattle, there is no competition for forages between sheep and cattle. However, as the number of cattle increases, they begin to compete with the sheep for the same plants. Once again, the shape of the curved segment FH indicates an increasing marginal rate of substitution between competing uses of the range.

Given positive values (prices) for the land uses discussed above, and assuming that multiple uses are indeed possible for the rangeland, the optimal (best economic) use of the land will be determined where a line with slope equal to the negative of the ratio of the prices ($-P_1/P_2$) is tangent to the tradeoff function. (Prices are on a per AUM basis.) This is illustrated by point E in each of Figures 5 and 7. In Figure 5, optimal multiple use of the range implies that 0A AUMs are allocated to domestic (cattle) grazing and 0B AUMs are allocated to deer. Likewise, in Figure 7, 0A AUMs are allocated to cattle and 0B AUMs to sheep. Although it is difficult to determine the price of an AUM for domestic cattle (and sheep) (see Barichello 1978, pp.39-44; Gee 1983), the major difficulty in this analysis is determining AUM values in wildlife production.

Figure 6 illustrates the case where simply finding market values for an AUM in cattle and elk will lead to the exclusion of one of the two uses of the range, unless the ratio of the prices happens to equal the biological ratio of AUMs per elk. The use of price ratios is an approximation to the correct procedure which is to find the marginal net benefit functions for both wildlife and domestic use of the range. That is, it is necessary to determine how the net benefit to cattle ranchers changes as one more AUM is provided and the net benefit to society (hunters and nonconsumptive users) when that AUM is made available to wildlife. In this case, the ratio of the marginal net benefits will have the form indicated by the curve MEN in Figure 6. However, there is greater difficulty in determining this relationship. This issue is considered further in the next section.

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[18] While somewhat suggestive of a nonlinear tradeoff function, linearity remains the workable assumption; only the year needs to be divided into more than one period.

The foregoing analysis can be extended to cases of commercial timber production versus livestock, timber production versus wildlife grazing and so on, or to the case of three or more possible uses of the land. For example, for the case of commercial timber production and cattle grazing, it is necessary to determine the shape of the biological transformation function (how much is timber production reduced as more cattle are grazed on commercial forest land) in addition to the prices of each of the uses (see Clary 1983). In the case of more than two land uses, the dimensions of the diagrams simply need to be increased, which makes visual but not mathematical conceptualization of the problem more difficult.

The foregoing analysis is also based on the assumption that resource allocation decisions are efficient at both the private and public level, enabling the economy to attain the product transformation frontier. Godfrey (1983) warns that resource allocation decisions often result in production at an interior point, such as C or D in Figure 5. Research by Graham and Borth (1988) indicates that this might indeed be the case for B.C. Hence, future research should focus on improving the efficiency of public institutions so that public range can be used to produce more of both domestic livestock and wildlife, for example.

Finally, an antagonistic relationship between land uses results when the transformation (tradeoff) function is convex to the origin as shown in Figure 8. Such a situation could occur if domestic cattle and, e.g., buffalo are susceptible to the same disease and one of the species becomes infected.[19] In Figure 8, an economically optimal mix of land uses (where the price line is tangent to the production function) occurs at one of the corners (either point X or Y in Figure 8). This implies incompatible land uses with single use the only feasible outcome. It is possible that construction of marginal net benefit functions results in a level of optimal multiple use, but this is unlikely and would depend, in any case, on the curvature of YX relative to that of the function constructed from the ratio of the marginal net benefits of cattle and buffalo.

Determining Optimal Use: Application

There have been only a few attempts to find the optimal multiple use of public rangeland.

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[19] Such a situation occurred on rangeland adjacent to Wood Buffalo National Park in Alberta in 1990. Wildlife officials were under pressure from ranchers to destroy infected bison.

Martin *et al.* (1978) argue that forestlands have four major economic use values: commercial timber production, water runoff, domestic grazing and recreation. They interpret the latter as related to wildlife grazing and habitat, with economic value accruing as a result of hunting. Two of these uses--wildlife (hunting services) and water runoff--are not traded in the market place. Given the difficulty of analyzing all four uses, Martin *et al.* focus on the tradeoff between hunting values and domestic grazing of cattle in Arizona. The rangeland manager is interested in determining (1) the allowable level of cattle grazing, (2) the level at which game species should be encouraged, and (3) the level of public access for hunting (and other recreational activities not considered in the study).

The study by Martin *et al.* is, first of all, an attempt to estimate the average, rather than marginal, tradeoff between land uses. They determine the loss in consumer plus producer surpluses from elimination of beef production on all public range in Arizona. The change in consumer surplus is determined by the area under the national retail demand curve for beef resulting from a reduction in Arizona output. Producer surplus is taken as the value of a cattle ranch in Arizona and determined by the sale price of such ranches. Likewise, the researchers assume a reduction in all elk hunting activity in Arizona since this is the land use that is most competitive with cattle. The area under the demand curve for elk hunting (determined in another study) is taken as the loss from using rangeland solely for the purpose of cattle production. No complementarity between uses is assumed.

Martin *et al.* conclude that beef production has a social worth that is five times greater than hunting. However, they note that hunters have been able to protect their rights in cases where conflicts arise because they have greater economic potential for political activity (p.96).

The main shortcoming of the Martin *et al.* study is that they consider an "all-or-nothing" scenario and do not permit more than one use of all the rangeland in Arizona. Cory and Martin (1985) address this shortcoming by postulating a biological tradeoff function that has the following linear form (see Figure 6):

$$Q_C = a - b\, Q_E,$$

where Q_C is the size of the cattle herd, Q_E is the size of the elk herd, and a and b are positive constants. The capacity of the rangeland under investigation is given by "a" for cattle and a/b for elk. In the central plateau of Arizona, 32 acres are required to support one animal unit, while 170 acres are required to support 1 AU in the deserts of the southwestern part of the state (Martin *et al.*, 1978); thus, to support a 700-cattle operation in the central plateau requires about 22,400 acres (9,068 ha) of rangeland. Cory and Martin use b=0.5, which they obtain from a biologist; thus, the carrying capacity for the range is half as many AUs of elk as cattle.[20]

In order to find an optimal, multiple use that does not result in a corner solution (choose one of the two uses), it is necessary to derive marginal net benefit functions for both cattle and elk. That is, to avoid a corner solution, it is not possible to have fixed prices for elk and cattle. The marginal net benefit function for public range in cattle production (NMB_C) can be found in the manner discussed earlier in conjunction with Figure 4.[21] The marginal net benefit function for public range in elk production (NMB_E) is determined, by Cory and Martin, from information about hunters' willingness-to-pay function for elk. (To address the management question relating to the number of hunting permits to issue, adjustments are made for the probability of success as a function of the number of hunting permits issued.) Finally, the optimal numbers of cattle and elk to permit on a given size of range is found by solving the following mathematical programming problem:

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[20] This falls within the range 0.33-0.625 AUM/elk indicated earlier.

$$\underset{\{Q_C\, Q_E\}}{\text{Maximize}}\; NB_C(Q_C) + NB_E(Q_E)$$

$$\text{Subject to} \qquad Q_C = a - b\, Q_E$$

$$Q_C, Q_E > 0,$$

where $NB_C(Q_C)$ is the net benefit function for cattle as a function of the number of cattle and $NB_E(Q_E)$ is the net benefit function for cattle as a function of the number of elk.

Upon applying their model, Cory and Martin find that "the marginal elk is much more valuable than the marginal beef animal" (p.290) indicating that cattle and elk numbers are far from an economically efficient equilibrium, as given by point E in Figure 6, for example. In particular, the evidence provided by the authors indicates that less cattle should be permitted on the range, thus encouraging greater elk numbers. This conclusion differs remarkably from that of Martin *et al.* (1978), thereby illustrating how average analysis can result in misleading conclusions for rangeland management.

Although Cory and Martin illustrate a correct procedure for analyzing multiple use of rangelands, they point out some inherent difficulties in their analysis. (1) Cooperation is required among economists, wildlife biologists and plant scientists in order to determine the transformation function between various land uses (in this case, cattle and elk). The carrying capacity of the rangeland in multiple uses needs to be determined, as does the effect of decisions on range condition trend. These are the production relations discussed earlier. (2) It is necessary to determine wildlife values, both for hunting and other recreational uses. In this regard, it is necessary to estimate the relationship between wildlife numbers and hunting success, and between willingness-to-pay and success. It is also important to relate nonconsumptive uses of wildlife to wildlife numbers. If neither of these tasks can be accomplished, "the economists' claim of assisting management is hollow" (p.292). (3) Difficult issues concerning impacts on recreation at alternative sites from changes in the opportunities at one site are ignored. (4) Finally, the analysis is static which is somewhat disconcerting since biological relations are dynamic.

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[21] Cory and Martin use a similar approach but focus on the beef market rather than the derived demand for range services as in Figure 4. However, the welfare measures (or marginal net benefit function) obtained will be the same regardless of the market in which measurement takes place.

Economic Efficiency and Multiple Use: Dynamic Analysis

In the preceding section, a static framework for analyzing decisions about multiple use was presented; however, the transformation or tradeoff function of traditional production theory embodies biological relationships that are inherently dynamic. Although it is still useful to analyze multiple use in the static framework, another approach is to treat the biological constructs as dynamic constraints. Indeed, in comparing static and dynamic optimizing in agriculture, Trapp (1989) argues that *simple* dynamic models may yield much better decision rules than static ones, even where the latter embody much more detail and complexity.

Burt (1971) was the first to suggest a dynamic optimizing model for making pasture and range decisions, although he was severely criticized for using unrealistic relationships (see Martin 1972; Bromley 1972). Martin (1972) argued that the information required by Burt was simply not available and may never become available. (In a broader sense, Martin's comment applies just as well to studies by himself and his colleagues cited in the previous section.) Upon assessing this comment 10 years later, Nelson (1983) indicates that the data problem remains; both she and Clary (1983) attribute this to a lack of coordination between biophysical scientists and economists in formulating research problems and in subsequent data collection and analysis. The study by Burt and subsequent studies (e.g., Karp and Pope 1984) focused only on optimal stocking rates and optimal timing of range improvements in both deterministic and stochastic environments. Nonetheless, a bioeconomic approach to range problems and multiple use can benefit from an approach similar to that suggested by Burt and by Howitt (1983), and outlined in Figure 1.[22] In the Appendix, a dynamic theoretical model of multiple use is presented and discussed. Implementation of such a model is constrained both by the lack of biophysical data (Howitt, p.32) and computing power.

The dynamic optimizing approach to analyzing multiple use offers some promise for reconciling conflicting land uses. The main advantage of the methodology is that it takes into account the impact of current decisions on the future state of the system, that is, on future costs and returns to the various uses. From an analytical perspective, it sheds light on issues of land tenure and the importance of reconciling land uses in an explicit fashion. The major obstacles to overcome have to do with the specification of appropriate functional forms, including the tradeoff or utility function of the decision maker, and finding an empirically tractable solution.

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[22] Studies of multiple use have been considered by Howitt (1983) and Huffaker *et al.* (1990). Based on personal discussions with Richard Howitt, he and his colleagues are the only ones who have empiricized a model of multiple use of rangeland. The results are currently not available to this author.

Given the current state of knowledge in B.C., and likely in the U.S., research needs to be focused in two directions. (1) It is important to gather more biophysical data about all aspects of the range, including in particular data about conflict among users. (2) At the same time, it is worthwhile to construct systems models along the lines indicated in Figure 1 and outlined above, incorporating biophysical data as it becomes available. This will require continuity in research funding and ongoing cooperation between resource modellers, biologists, economists, and other researchers.

Distributive Equity and Multiple Use

Major rangeland issues in the western U.S. have been associated with attempts by the Bureau of Land Management (BLM) and the U.S. Forest Service to increase grazing fees or reduce the numbers of cattle grazed on particular rangelands (Bromley *et al.* 1968; Obermiller 1982; Radtke *et al.* 1985). The reasons had to do with agency revenues and with grazing capacity--BLM biologists felt that overgrazing was taking place, but others disputed this or felt that the public agencies needed to invest resources in range improvements. Either an increase in grazing fees or a reduction in permitted grazing on public lands will result in a welfare loss to ranchers. Such a welfare loss is considered to be a violation of their inalienable property rights to the public range (Obermiller 1982). (A mechanism for mitigating against either action is discussed in the next section.) However, there is also a loss in economic activity in the regions that are impacted by reduced grazing or higher grazing fees.

Historically, the method for analyzing the regional economic development impacts of changes in land use has been via primary-data, local input-output (I-O) models (see Bromley *et al.* 1968). Obermiller (1983) defends the use of regional I-O models as the appropriate tool for analyzing income distributional consequences of rangeland decisions. Radtke *et al.* (1985) compare the use of primary-data, I-O models with those derived from secondary data and conclude that, given the current state of the art, regional changes in economic activity are best measured by primary-data, I-O models. While such models are expensive to develop, they offer the best tool for both extension work (aiding farmers and small businesses in anticipating, adjusting to, and taking advantage of changes in economic conditions, technology and government programs) and analyzing the local economic impacts of resource use investments and decisions.[23]

In a multiple-use context, regional I-O models can be used to determine the impacts on a local economy of changes in the allocation of range resources, logging activity, tourism and hunting occurring as a result of public decisions concerning the optimal use of forest lands. While such models can aid in identifying the income distributional consequences of public planning, it is left to the decision maker to determine how these are to be mitigated against, if at all.

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[23] An important methodological consideration is that regional I-O models are square as opposed to rectangular. Existing models of both the Canadian and B.C. economies are rectangular in form. A description of square I-O models and their relationship to rectangular ones is found in Van Kooten (1990).

Fairness and Political Acceptability

An important aspect of public range management concerns historical property rights. While historical rights to resources such as the range appear to be well established in the United States, they are less obvious in Canada. However, there is implicit recognition of historical property rights when, for example, federal funds for agricultural programs (ARDA/ARDSA) include contributions to improving public range resources in B.C. Further, any subsidy component related to public provision of forage is capitalized in ranch values and attempts to dramatically depart from previous policies (e.g., by large increases in grazing fees) will result in unanticipated and unfair losses to ranchers. Thus, based on both criteria of fairness and political feasibility, it is unlikely that government decision makers would restrict rancher's access to public range or even reduce the number of AUMs available to them (either through regulation or substantial increases in grazing fees). However, there may be circumstances where it is necessary to restrict domestic grazing on public range for reasons of economic efficiency (e.g., grazing by elk has greater social value).

Whenever decisions regarding the use of public range require a reduction in domestic grazing, it will be necessary to compensate ranchers for their losses because of the historical inviolability of their property rights. The question that needs to be addressed is not whether compensation should take place, but, rather, how compensation should occur. One approach is to simply pay ranchers according to the AUMs of grazing that are lost. This poses a difficulty associated with the evaluation of such losses, but this is not an insurmountable difficulty, although one that could have political ramifications. Some compensation schemes may not be politically acceptable either to the ranchers or to the public at large (as represented by the government), or both. Further, compensation is not economically efficient since it does not lead to the best land use.

One approach to resolving the conflict between multiple use and historic property rights, and yet obtain a solution that is economically efficient, is to charge ranchers a higher fee for grazing while, at the same time, providing compensation based on the amount of forage left behind or not used. The reason for increasing grazing fees is that these are administered prices and do not reflect the true opportunity cost of grazing. The current system of grazing fees results in inefficient allocation of the range between cattle and other uses (primarily big game). Further, grazing fees do not now take into account differences in range productivity which is both inefficient and unfair (see Ministry of Forests 1989, p.18). An increase in grazing fees and/or a change in the structure of fees will increase efficiency of land use, but it will also take away implicit rights that ranchers currently enjoy. This is the reason that fee increases have been resisted--such increases, both in B.C. and the U.S., are politically not feasible.

One mechanism for making higher grazing fees more acceptable is to compensate ranchers according to the amount of forage that is left unused on the public range.[24] An offsetting fee structure (where producers are paid for unused grazing) can improve land use efficiency since it takes into account other uses of the range. For such a system to work, range utilization by cattle and wildlife, and range productivity, will need to be determined and monitored by biologists.

Huffaker *et al.* (1989) consider an institutional arrangement (for that is what it is) for shifting "forage away from livestock production to the provision of competing nongrazing uses" (p.671), but without subsequently changing the income distribution resulting from historic grazing rights on public lands. Their approach is directed at improving public rangelands and satisfying the multiple-use mandate in the U.S.'s Public Rangelands Improvements Act of 1978. The researchers use an optimal control model to determine both the levels of the grazing fee and compensation. They note that:

> "Implementation of the offsetting fee system implies that the government has access to a sizable amount of allotment-specific biological and economic information in order to compute the offsetting grazing fees and compensation associated with particular grazing allotments. However, in the real world, the government realistically cannot acquire such detailed information. Hence, the government is limited in applying the offsetting fee system to trying different combinations of fees and compensation payments until one is found which induces the required stocking response" (Huffaker *et al.* 1989, p.677).

Although there are practical difficulties implementing an offsetting fee system, it is possible to overcome them. Further, it is likely to result in an efficient, effective and fair allocation of the range resource among competing users.

The major limitation of the foregoing analysis is that it does not address the issue of grazing by wildlife. In principle, as suggested above and by the authors themselves, the analysis can be extended to include grazing by wildlife. Commercial timber values on clearcut land could also be taken into account by, for example, compensating ranchers in a way that encourages them to prevent trampling damage to tree seedlings by their cattle. However, in these cases, greater information about the bioeconomics of the system than is currently available will likely be required.

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[24] The Ministry does the opposite for tenured grazing rights, charging livestock producers a lower fee of $0.20/AUM for unused AUM grazing only if less than 90% of the tenure is used (Ministry of Forests 1989, p.19). While this is ostensibly done to avoid nonuse of the range resource, there are situations where nonuse might be encouraged, especially on land that is important for big game animals and where conflicts occur.

Finally, Huffaker *et al.* recommend that fees be assessed for non-grazing services received by environmentalists and recreationalists, wherever these can be identified and assessed. This will help to allocate public range in an economically efficient manner among multiple uses.

The offsetting fee system recognizes issues of economic efficiency, fairness (equity) and political acceptability. It is fair because the grazing fee and payment for unused forage can be set in a way that leaves the welfare of ranchers unchanged; their historical property right is protected, with ranch values remaining unaffected. It would also seem that an offsetting fee structure is politically acceptable for that reason and the fact that users of the range pay according to the actual grazing value of the range. However, it is still necessary to determine the origin of the funds needed to pay ranchers for leaving behind forage. A mechanism for charging hunters, recreationalists and environmentalists according to the value they place on the land in an alternative use needs to be determined. This can be done via increased hunting fees, that are somehow related to the probability of hunter success (i.e., wildlife numbers), hiking tolls, *et cetera.*

DISCUSSION AND RECOMMENDATIONS

The majority of rangelands in B.C. are owned and managed by the government. While some would argue that private ownership of the range will result in more efficient use, there are three compelling arguments favouring continued public ownership and management. Firstly, private users may deplete the range through overgrazing because they employ a higher discount rate than that used by society. There will be a tendency to liquidate range assets and invest the funds in alternatives yielding higher rates of return. This is particularly true if range resources have common property aspects to them, which may be the case for forest range that is given over to private users.

Secondly, in addition to ranchers' rights, rights of timber companies and dependent communities cannot be ignored. After all, grazing often takes place on clearcut land, land that is in the process of producing new growth for future timber harvests.

Finally, there are *externality* aspects associated with livestock use. Externality is of two types: *ownership* or *technological externality* and *public goods externality*. Under current institutional arrangements, hypothetical private owners of what is now public range cannot capture the external benefits of maintaining the range resource, nor do they pay the true social costs of using the range. For example, hunters benefit from investments in range improvements, but private owners cannot capture these benefits by charging individuals for shooting game on their land; nor do ranchers bear the full cost when congregating cattle cause damage to watershed resources. These are examples of ownership externality. Examples of public goods externality occur because ranchers or other potential private owners of what is now public forest land have no incentives to preserve wildlife species and scenic amenities. Given multiple use of range and forest land resources, it is unlikely that alternatives to public ownership and management exist. Thus, discussion of provincial forest range should take place in the context of public ownership and management.

One aspect of multiple use that was not considered in the foregoing discussion concerns exclusive or primary use. This refers to the concept of limiting use on land to one major activity; each land unit is allocated to a particular use, with other possible uses relegated to a secondary status. Such an approach makes sense for some of the use and nonuse demands. Certain recreational pursuits require use of large areas and nondivisibility is one characteristic of use, especially when the sought after attributes are solitude and space (e.g., wilderness areas). This activity is incompatible with either logging or domestic grazing. The same might be true of certain watershed functions and wildlife habitat (e.g., northern spotted owl).

In some sense, delineation of primary uses for rangeland, or forest land in general, results in the rural counterpart of urban zoning. Thus, for example, wildlife grazing might be permitted on a certain land area to the exclusion of cattle, while cattle are permitted in another area to the exclusion of recreational use and, to the extent possible, wildlife grazing. This separation of competing uses is done primarily for administrative convenience and practicality. It does not deny multiple use but, rather, explicitly accounts for multiple use by designating land areas to specific, primary uses. The success, relevance and political acceptability of such an approach is dependent upon the size of the unit of measurement that is chosen. If the unit of measurement is large (e.g., a watershed), then the system will likely be unacceptable politically because it requires designation to single use of too large a unit. If the unit of measurement is too small (e.g., a hectare), then the system will bog down in an administrative quagmire. In both cases, there will be concern about whether the unit is ecologically relevant and this issue will need to be addressed.

A form of zoning is currently practised by the Ministry (see Duffy 1990). The method involves using map overlays to determine the dominant and, perhaps, only use. The problem with this method is that it relies on physical attributes of land resources as opposed to the more relevant economic attributes. This can result in land uses that are inefficient (see Van Kooten 1991).

While assigning single use is more difficult in the case of wildlife/cattle conflicts, the principle remains the same. Unless substantially more information becomes available, it may be best to allocate range to cattle on the basis of knowledge, however sparse it may be, about its stocking capacity for various uses and it ability to withstand grazing without deterioration. That is, regulation can be relied upon to allocate the range in the short term. In the intermediate and longer term, it is necessary to allocate range more efficiently than appears to have been the case in the past. A start towards that end can be made by developing appropriate institutions to encourage efficiency without compromising equity and political acceptability.

Recommendations

The B.C. Task Force on the provincial Range Program (Ministry of Forests 1989) made a large number of recommendations concerning the current status of management of range resources. Many of these pertain to administrative and other internal procedures that are not addressed in this study. Overall, the Task Force found the current Range Act and administrative practices to be less than desirable, concluding that major changes need to be made. The purpose here is not to repeat those recommendations, but to provide another perspective on range economics issues. The recommendations below highlight some of the ones found in the Task Force report, while putting forward others that were not considered there.

(1) It is necessary to get economists involved in the beginning stages of range research, in problem identification, data collection and so forth. One important step will be to identify the feasibility of range management projects that might be considered. There is no sense in proposing management regimes that cannot pass even the simplest cost-benefit criterion; while some management practices may be feasible from a biophysical point of view, they may be rejected outright from an economics standpoint. Identification of infeasible projects will not only save public monies in the future but also valuable research resources that might otherwise be employed in more fruitful endeavours.

(2) In economic feasibility studies, it is necessary not only to take into account domestic grazing but also wildlife grazing and site stabilization. Cost-benefit analysis of range improvements--prescribed burning, seeding, plowing and seeding, scarification, fertilization, fencing, *et cetera*--can help identify practices that can be rejected outright because they are highly inefficient.

(3) Current grazing fees do not represent actual market values and this is one reason why livestock production results in inefficient resource use. Although increasing grazing fees is likely to be opposed by agricultural producers and will not be politically feasible, a system of offsetting fees addresses this issue head on. By permitting grazing fees to increase and compensating producers for forage left for other users, or tree seedlings left untrampled, economic efficiency is enhanced while income distributional concerns are accounted for. Research toward implementing such a system for B.C. should be pursued.

(4) Other users of range resources should contribute to the administrative costs and improvement of range resources. Such payments could possibly be provided to livestock producers as compensation under an offsetting fee system or used to offset the difference between the Ministry's costs and revenues in managing public rangeland.

(5) It is important to develop institutions that encourage efficiency without compromising equity and political acceptability. Some have been suggested, but additional research is required both to think up new ones and to implement them in British Columbia.

(6) More systems modelling research and practice (*viz.*, extension) is required. Models may not be entirely representative of the rangeland ecology nor need they be. Often the experience gained from modelling complex rangeland interactions is sufficient to enable decision makers to alter their perspective in field practice. Economic considerations should not be neglected in the modelling exercises.

Table 1: Distribution of Livestock (All Types) on Crown Range by Forest Region (000's AUMs)

Year	Forest Region						TOTAL
	Nelson	Kamloops	Caribou	Prince George	Prince Rupert	Vancouver	
1969	110.3	681.6	-	50.6	-	-	842.5
1970	97.9	674.7	-	49.3	-	-	821.8
1971	98.5	672.3	-	58.3	-	-	829.1
1972	91.5	322.5	331.0	42.0	-	-	786.9
1973	82.6	322.0	332.5	45.7	-	-	782.7
1974	81.7	320.1	349.0	57.8	-	0.6	809.2
1975	79.6	316.3	327.2	61.9	1.8	0.6	787.4
1976	77.7	316.0	332.5	86.6	1.6	0.4	614.6
1977	71.4	316.8	324.9	112.7	2.0	0.4	828.2
1978	74.0	313.1	351.7	130.5	2.0	0.3	871.6
1979	73.8	307.1	386.2	124.7	15.7	0.7	908.1
1980	75.0	321.3	367.4	140.5	26.4	0.6	931.2
1981	75.0	318.9	364.6	138.0	24.7	0.6	921.9
1982	77.7	326.8	362.9	154.7	35.0	0.7	957.9
1983	99.4	332.4	360.8	129.4	32.3	0.8	934.9
1984	80.4	333.1	362.7	129.1	31.1	1.4	937.8
1985	78.4	325.2	358.4	137.1	30.1	1.8	931.0
1986	74.5	330.9	349.4	141.9	30.0	2.7	929.2
1987	71.5	327.7	335.6	126.3	28.5	2.7	892.2
1988	74.2	330.9	325.7	128.1	28.2	2.4	889.5

Source: 1969-80, Nordstrom (1984, p.4)
1981-88, Ministry of Forests (annual).

Table 2: Utilization of Crown Rangeland by Forest Region (TSA Data)

Region	Hectares mil.	Percent	Actual Use AUMs	Percent
Caribou	2.2	26	360,295	39
Kamloops	1.3	16	343,941	37
Nelson	0.3	4	78,585	9
Prince George NE	1.9	23	95,348	10
Prince George	0.5	6	35,952	4
Prince Rupert	2.1	25	5,551	1
TOTAL	8.3	100	919,672	100

Source: Ministry of Forests (1984, pp.D9-D10).

Table 3: Occurrence of Open Rangeland in B.C. by Forest Region

Region	Hectares	% of Public AUMs Harvested
Prince George NE	10,952	--
Prince George	3,008	--
Nelson	42,742	22
Caribou	141,254	14
Prince Rupert Coast	10	--
Prince Rupert Interior	9,394	—
Kamloops	134,376	15
TOTAL	341,736	13

Source: Ministry of Forests (1984, p.B62).

Table 4: Available Public Grazing by Forest and Range Type ('000's Hectares)

Range Types	Forest Region						TOTAL
	Nel-son	Kam-loops	Cari-boo	Prin. G'rge	Prin. Rupert	Van-c'vr	
Under-developed Native Pasture	-	-	-	576	-	-	576
Community Pasture	-	-	-	11	-	-	11
Reserve	-	-	-	148	-	-	148
Pasture Development Potential	-	-	-	35	-	35	70
Open Range	22	430	228	-	11	-	691
Open Forest	350	820	169	-	43	-	1,382
Meadows	-	20	278	-	11	-	309
Forest	462	2,500	2,158	-	155	-	5,275
Alpine	6	-	-	-	-	-	6
TOTAL	840	3,770	2,833	770	220	35	8,468

Source: Nordstrom (1984, p.3).

Table 5: Relative Importance of Public Range Types in Providing Forage for Domestic Livestock

Range Type	% Land Area	% AUMs Harvested
Open Range	0.4	13
Dry Forest	4.4	22
Clearings	0.2	8
Lodgepole Pine	11.7	12
Transitional/Brush	12.6	22
Deciduous Forest	4.6	8
Wetland	2.0	7
Other	64.0	8

Source: Ministry of Forests (1984, p.B40; 1989, p.10).

Table 6: Percent Occurrence of Transitional Forest Rangelands by Forest Region

Region	Aggregate (ha.)	% Transitional
Prince George NE	614,325	15.3
Prince George	692,607	71.4
Nelson	246,423	61.3
Caribou	340,135	86.8
Prince Rupert Coast	53,023	14.3
Prince Rupert Interior	732,725	53.5
Kamloops	355,487	76.8
Vancouver	272,474	43.7
TOTAL	3,307,474	38.4

Source: Ministry of Forests (1984, p.B64).

Table 7: Grazing Productivity on Forest vs. Clearcut Land

Range Type	Location	Stocking (ha/AUM)	Average Daily Gains (kg)	Class of Animal
Clearcut	B.C.	0.73	0.64 0.13	calves cows
Forest	B.C.	1.94	0.79	yearling steers
Clearcut	Oregon	0.66	0.74	yearling steers
Forest	Oregon	1.21	0.48	yearling steers

Source: Nordstrom (1984, p.68)

Table 8: Stocking Rate and Effect on Livestock Growth

Stocking Rate	Cows		Calves	
ha/AUM	kg/head/yr	kg/ha/yr	kg/head/yr	kg/ha/yr
4.0	16.8	1.12	88.0	5.71
1.2	13.2	1.12	81.7	6.95
0.8	-1.8	-0.11	76.2	8.96

Source: Nordstrom (1984, p.68)

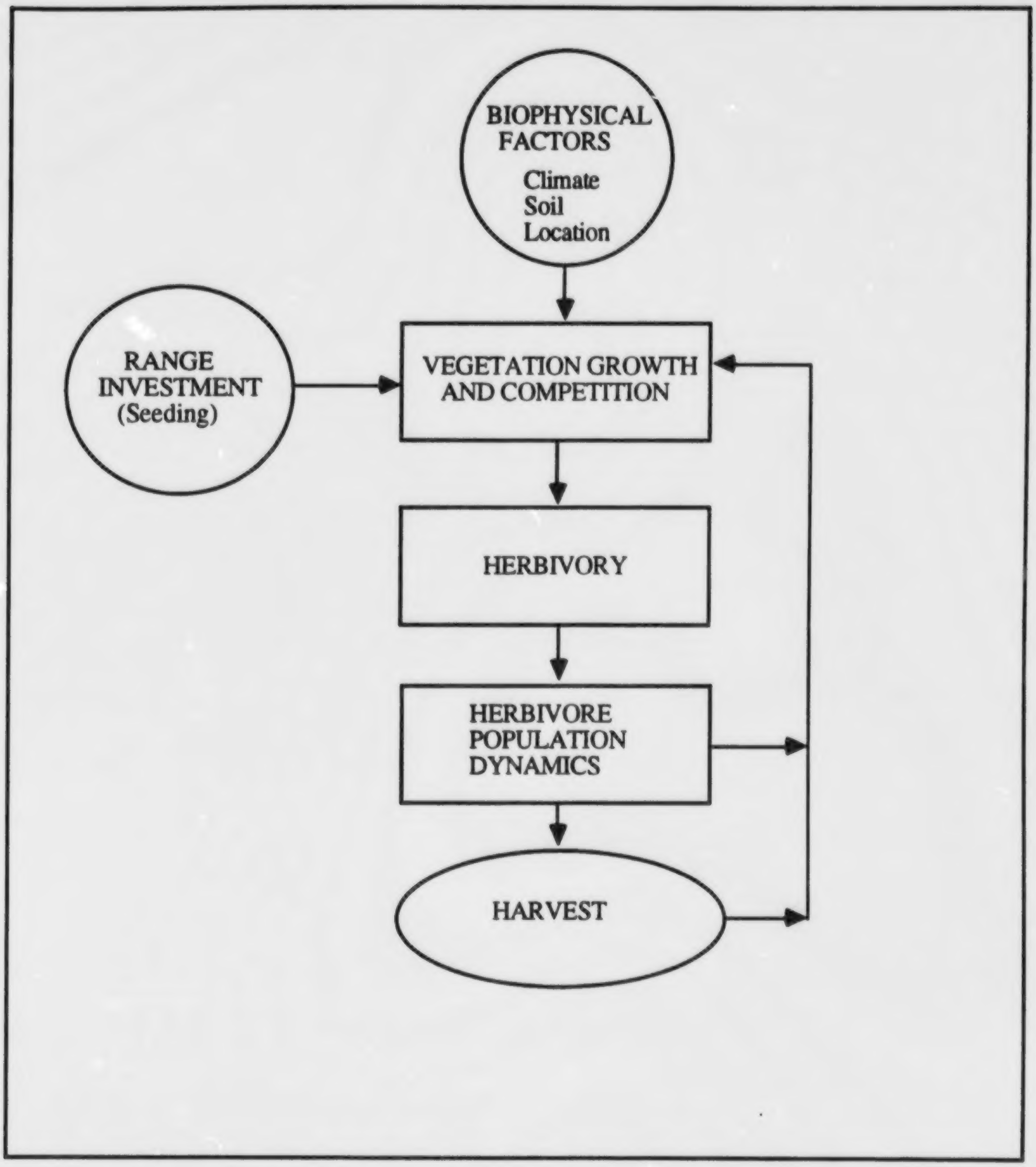

BIOPHYSICAL FACTORS
Climate
Soil
Location
RANGE INVESTMENT (Seeding)
VEGETATION GROWTH AND COMPETITION
HERBIVORY
HERBIVORE POPULATION DYNAMICS
HARVEST

FIGURE 1: Systems Model of Rangeland Use

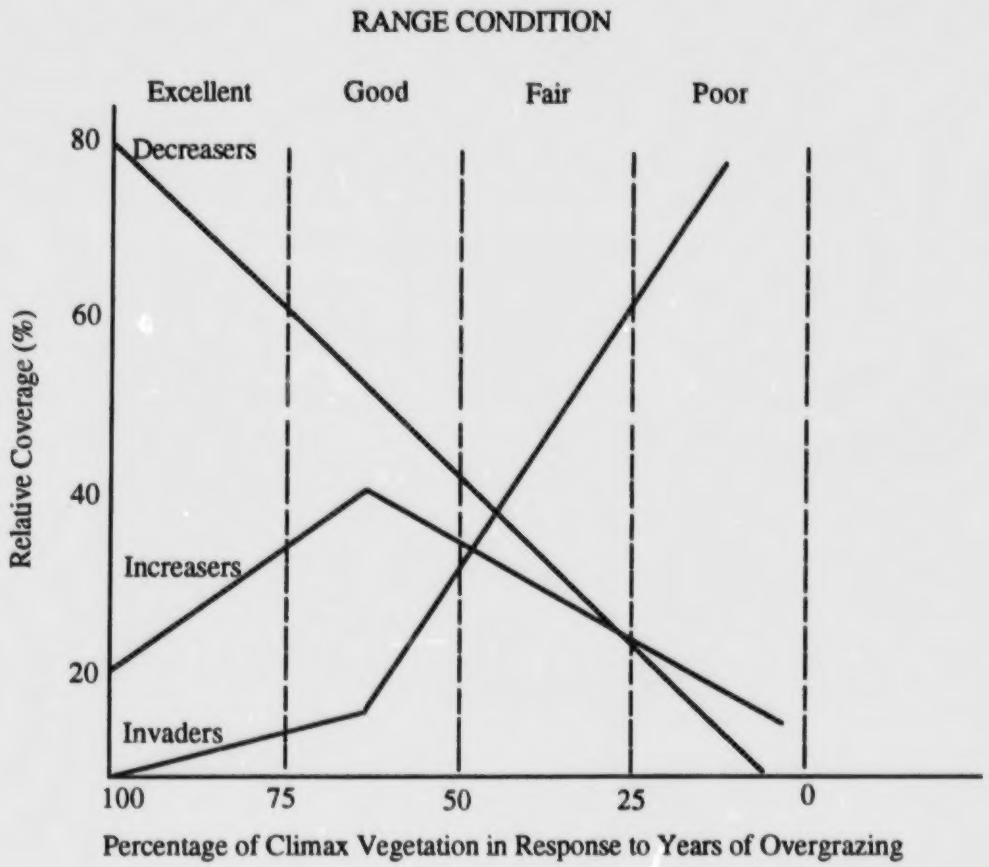
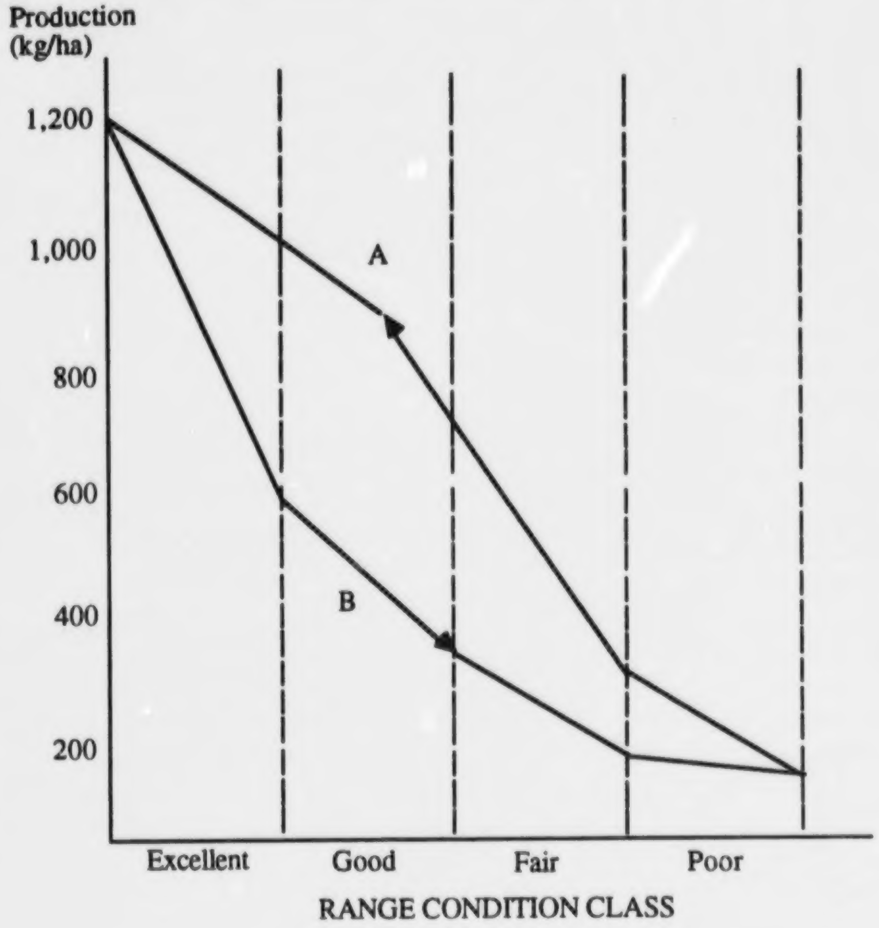


FIGURE 2: Qualitative Basis for Determining Range Condition



% Utilization				
Cattle	85	65	45	25
Antelope	10	25	40	50
Carrying Capacity of 100 ha Range				
Cattle	22	12	5	1
Antelope	39	54	58	30

FIGURE 3: Production Functions for Vegetation and Herbivores for Hypothetical 1,000 Ha Range in Texas

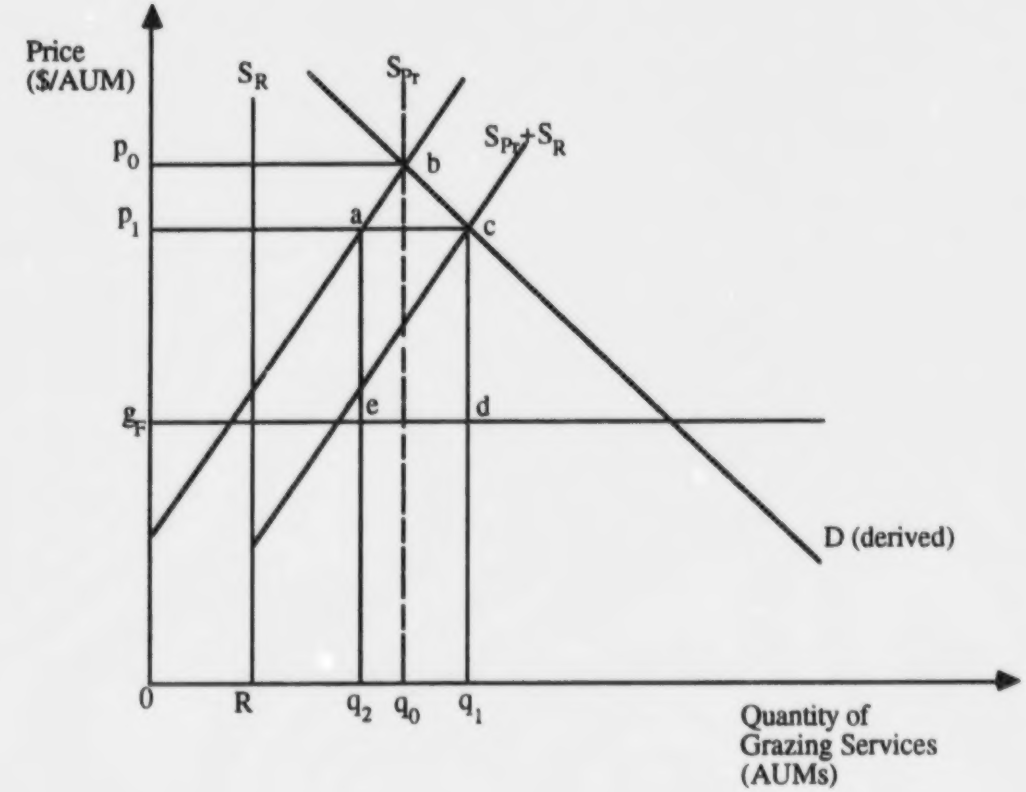


FIGURE 4: Benefits of Grazing on Public Rangeland

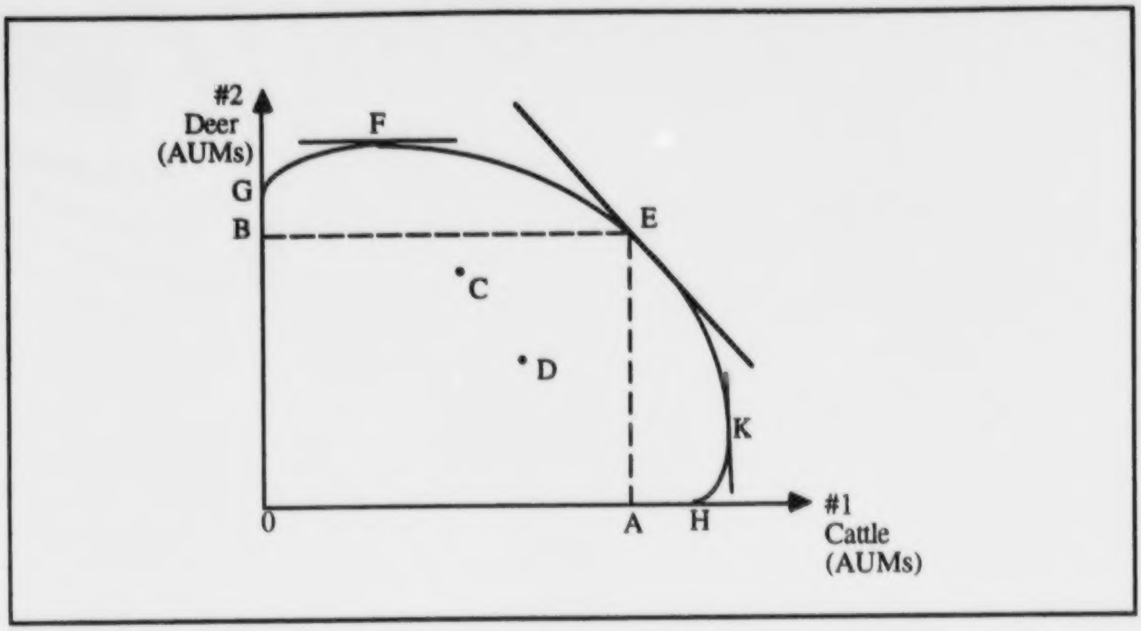

#2
Deer
(AUMs)
F
G
B
E
C
D
K
0
A
H
#1
Cattle
(AUMs)

FIGURE 5: Complementary and Competitive Land Use

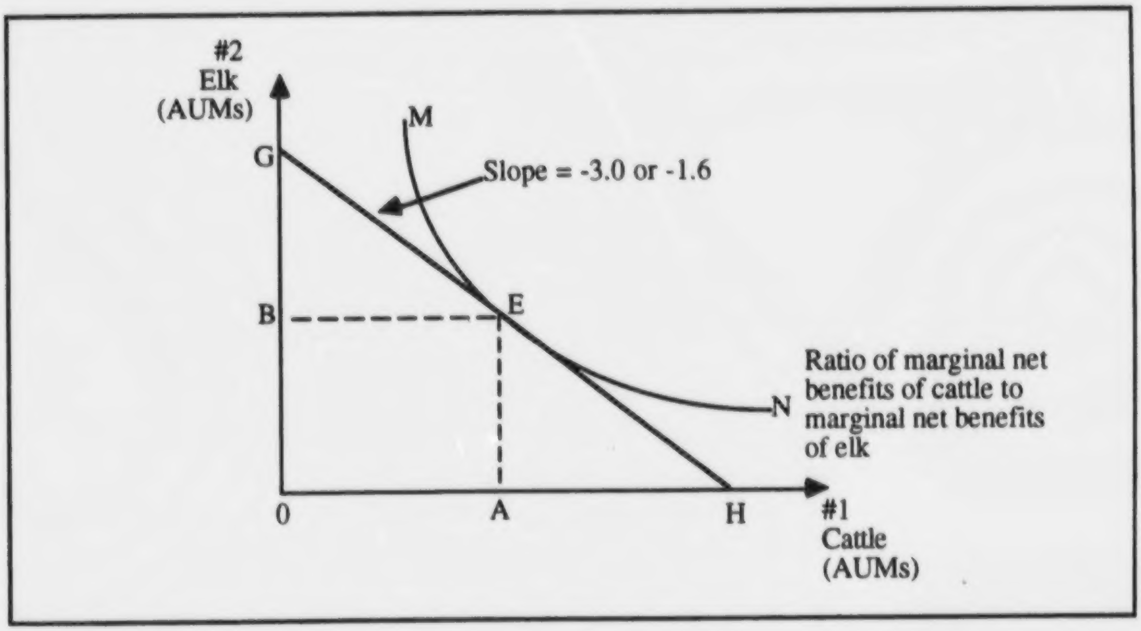

#2
Elk
(AUMs)
M
G
Slope = -3.0 or -1.6
B
E
Ratio of marginal net benefits of cattle to marginal net benefits of elk
N
0
A
H
#1
Cattle
(AUMs)

FIGURE 6: Constant Rate of Substitution

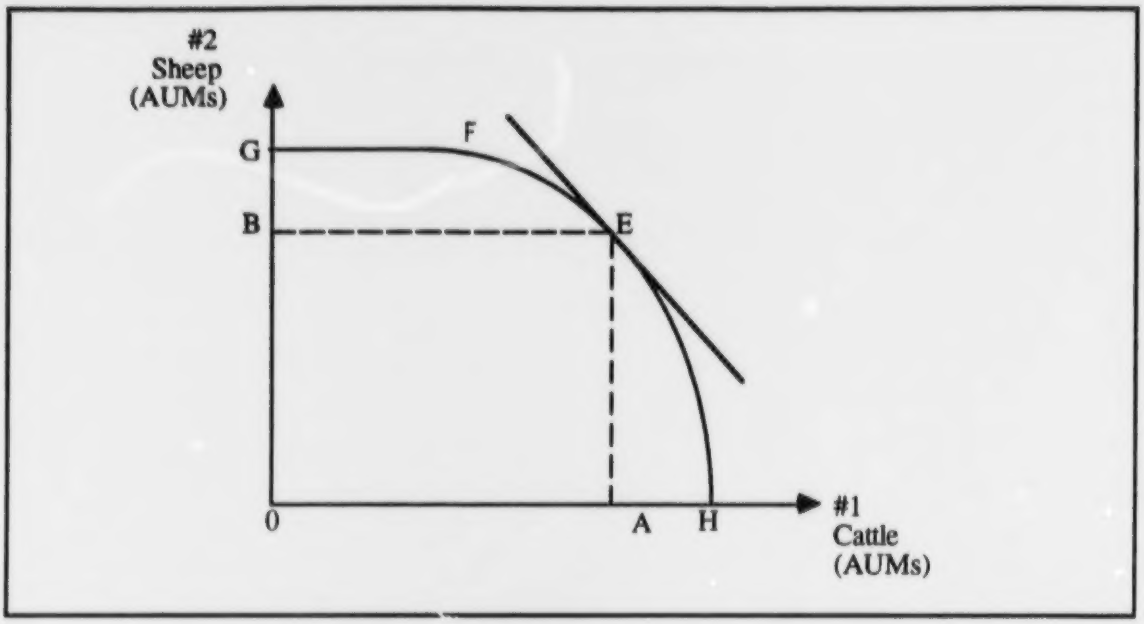

#2
Sheep
(AUMs)
G
F
B
E
0
A
H
#1
Cattle
(AUMs)

FIGURE 7: Supplementary Land Uses

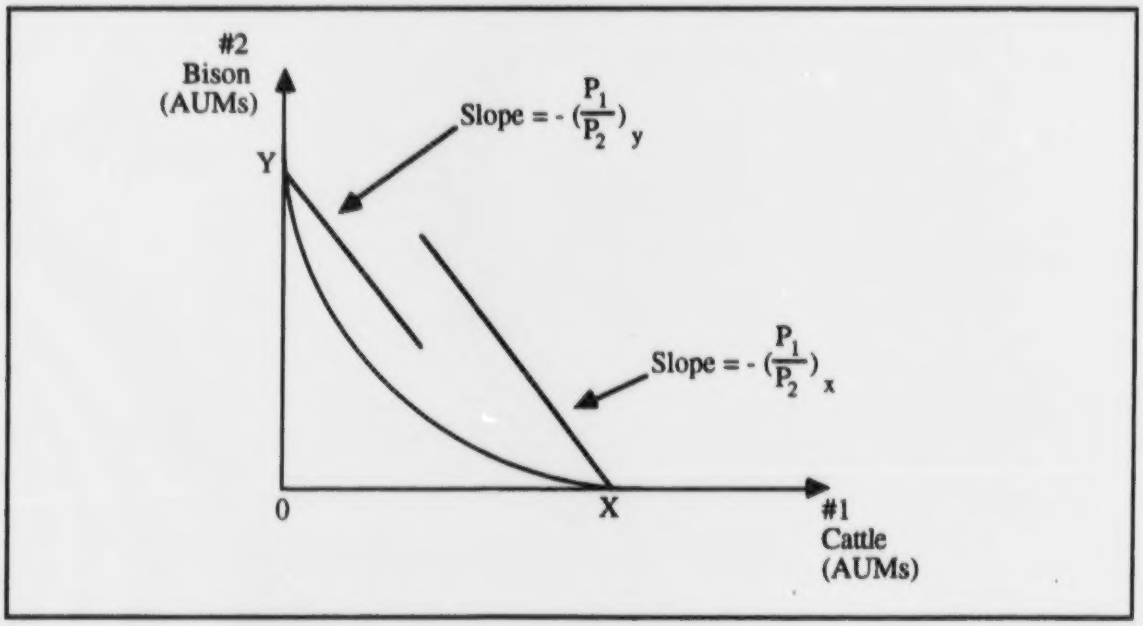

#2
Bison
(AUMs)
Slope = - $(\frac{P_1}{P_2})_y$
Y
Slope = - $(\frac{P_1}{P_2})_x$
0
X
#1
Cattle
(AUMs)

FIGURE 8: Economically Incompatible (Antagonistic) Land Uses

REFERENCES

Anderson, E.W., 1962. "Behavior of Forage Yields on Some Range Sites in Oregon", Journal of Range Management 15(September): 245-52.

Barichello, R.R., 1978. An Economic and Distributive Evaluation of Community Pasture Programs. Research Report. Vancouver: Univ. of British Columbia, Dep. of Agric. Economics.

British Columbia Ministry of Forests, 1989. Range Program Review. Final Report on the Review Task Force. Victoria: Integrated Resources Branch, September.

British Columbia Ministry of Forests, 1984. Forest and Range Resources Analysis. Victoria: Strategic Studies Branch, September.

British Columbia Ministry of Forests, 1980. Forest and Range Resources Analysis. Victoria: Strategic Studies Branch, September.

Bromley, D.W., 1972. "A Dynamic Economic Model of Pasture and Range Investments: Comment", American Journal of Agricultural Economics 54(February): 131.

Bromley, D.W., G.E. Blanch and H.H. Stoevener, 1968. Effects of Selected Changes in Federal Land Uses on a Rural Economy. Station Bull. 604. Corvallis: Oregon State Univ. Agr. Exp. Sta., March. pp.27.

Burt, O.R., 1971. "A Dynamic Economic Model of Pasture and Range Investments", American Journal of Agricultural Economics 53(May): 197-205.

Ciriacy-Wantrup, S.V., 1968. Resource Conservation. Economics and Policies. 3rd edition. Berkeley: Univ. of California, Agricultural Exp. Station.

Clary, W.P., 1983. "Interfacing Physical Data and Economics". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp.115-19.

Cory, D.C. and W.E. Martin, 1985. "Valuing Wildlife for Efficient Multiple Use: Elk Versus Cattle", Western Journal of Agricultural Economics 10(December): 282-93.

Costanza, R., 1989. "What is Ecological Economics?" Ecological Economics 1(February): 1-7.

Duffy, Dorli, 1990. "A Review of the British Columbia Crown Land Allocation and Management Process". Background study prepared for the B.C. Forest Resources Commission.

Dyksterhuis, E.J., 1949. "Condition and Management of Range Land Based on Quantitative Ecology", Journal of Range Management 2(July): 104-15.

Fox, I., 1990. "Multiple Use Management of Crown Forestlands in British Columbia", FEPA Newsletter 5(April): 12-14.

Gee, C.K., 1983. "The Use of Linear Programming to Estimate Range Forage Values". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp. 89-91.

Godfrey, E.B., 1983. "Economics and Multiple Use Management on Federal Rangelands". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp. 77-81.

Godfrey, E.B. and C.A. Pope III, 1990. "The Case for Removing Livestock from Public Rangelands". In Current Issues in Rangeland Resource Economics edited by F.W. Obermiller. Special Report 852. Corvallis: Oregon State University Extension Service, February. pp.6-23.

Graham, J.D. and D. Borth, 1988. "An Inventory Approach for Common Use Stock Range Units in British Columbia", Canadian Journal of Agricultural Economics 36(July): 279-94.

Gray, J.R., 1983. "An Historic Look at Range Economics Research". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp. 1-11.

Howitt, R.E., 1983. "Rangeland as a Collective Capital Good". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp. 32-37.

Huffaker, R. and B.D. Gardner, 1987. "Rancher Stewardship on Public Ranges: A Recent Court Decision", Natural Resources Journal 27: 887-98.

Huffaker, R.G., J.E. Wilen and B.D. Gardner, 1990. "A Bioeconomic Livestock/Wild Horse Trade-off Mechanism for Conserving Public Rangeland Vegetation", Western Journal of Agricultural Economics 15(July): 73-82.

Huffaker, R.G., J.E. Wilen and B.D. Gardner, 1989. "Multiple Use Benefits on Public Rangelands: An Incentive-Based Fee System", American Journal of Agricultural Economics 71(August): 670-78.

Huffaker, R.G. and J.E. Wilen, 1989. "Dynamics of Optimal Stocking in Plant/Herbivore Systems", Natural Resource Modelling 3/4(Fall): 553-75.

Joyce, L., 1989."An Analysis of the Range Forage Situation in the United States: 1989-2040". USDA Forest Service Resources Program and Assessment Staff, Washington D.C., Mimeograph.

Karp, L. and A. Pope, III, 1984. "Range Management under Uncertainty", American Journal of Agricultural Economics 66(November): 437-446.

Kearl, W.G. and P.D. Hoye, 1983. "Meat--An End Product from Rangeland. Current Production and Consumption Situation and Implication". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp. 19-31.

Loomis, J., D. Donnelly and C. Sorg-Swanson, 1989. "Comparing the economic value of forage on public lands for wildlife and livestock", Journal of Range Management 42(March): 134-38.

Martin, W.E., 1972. "More Sophisticated Tools for Less Important Problems: The History of Range Improvement Research: A Comment", American Journal of Agricultural Economics 54(February): 132-34.

Martin, W.E., J.C. Tinney and R.L. Gum, 1978. "A Welfare Economics Analysis of the Potential Competition Between Hunting and Cattle Ranching", Western Journal of Agricultural Economics 3(December): 87-97.

McKelvey, R., 1980. "Rangeland Seminar Notes". Corvallis: Oregon State Univ., Mimeograph. May 17.

Nelson, J.E., 1983. "Range Economics in the Bureau of Land Management". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp. 38-42.

Nordstrom, L., 1984. The Ecology and Management of Forest Range in British Columbia: A Review and Analysis. Land Management Report Number 19. Victoria: Ministry of Forests, November. pp.91.

Obermiller, F.W., 1983. "Opportunities for the More Intensive Use of Input-Output Analysis in Public Rangeland Decision Making". In: Proceedings--Range Economics and Symposium Workshop compiled by Fred J. Wagstaff. U.S. Forest Service Gen. Tech. Rep. INT-149. Ogden: Intermountain Forest and Range Experiment Station. pp. 100-109.

Obermiller, F.W., 1982. "Economic Efficiency vs. Distributive Equity: the 'Sagebrush Rebellion'", Western Journal of Agricultural Economics 7(1982): 253-63.

Pitt, M.D., 1990. Department of Plant Science, Univ. of British Columbia, Personal communication (May 16).

Pitt, M.D., 1982. East Kootenay Problem Analysis. The Interactions Among Grass, Trees, Elk and Cattle. Victoria: Research Branch, Ministry of Forests, February. 65pp.

Quigley, T.M., 1989. "Value Shifts in Multiple Use Products from Rangelands", Rangelands 11(December): 275-79.

Quigley, T.M. and E.T. Bartlett, 1990. "Livestock on Public Lands: Yes!". In Current Issues in Rangeland Resource Economics edited by F.W. Obermiller. Special Report 852. Corvallis: Oregon State University Extension Service, February. pp.1-5.

Quigley, T.M. and J.W. Thomas, 1989. "Range Management and Grazing Fees on the National Forests--A Time of Transition", Rangelands 11(February): 28-32.

Radtke, H., S. Detering and R. Brokken, 1985. "A Comparison of Economic Impact Estimates for Changes in the Federal Grazing Fee: Secondary vs. Primary Data I/O Models", Western Journal of Agricultural Economics 10(December): 382-90.

Starfield, A.M. and A.L. Bleloch, 1986. Building Models for Conservation and Wildlife Management. New York: Macmillan.

Stevens, J.B. and E.B. Godfrey, 1972. "Use Rates, Resource Flows, and Efficiency of Public Investment in Range Improvements", American Journal of Agricultural Economics 54(November): 611-21.

Talisman Resource Consultants, 1989. Beef Industry Study. Vancouver: Mimeograph.

Trapp, J.N., 1989. "The Dawning of the Age of Dynamic Theory: Its Implications for Agricultural Economics Research and Teaching" Southern Journal of Agricultural Economics 21(July): 1-11.

Van Kooten, G.C., 1991. Land Economicsand Sustainable Development. An Introduction to the Resolution of Land Use Conflicts. Vancouver: Dept. of Agricultural Economics, U.B.C., Mimeograph.

Walters, C., 1986. Adaptive Management of Renewable Resources. New York: MacMillan.

Workman, J.P., 1986. Range Economics. New York: MacMillan.

APPENDIX

Dynamic Optimizing Model of Multiple Use of Rangelands

Consider the following multiple use, dynamic model of forest rangelands as an illustration. The state variables are the descriptors of the current range environment. These descriptors include:

V = the vegetation biomass available for herbivores;

TM = the number of trees or volume of commercial timber growing on the site;

W = an index of wildlife population; and

I = the stock of range improvements, including fencing, domestic grasses that have been seeded, *et cetera*.

The state variables are affected by the actions of the policy makers at each stage in the decision process--the decision or control variables. These are:

C = the stocking rate of domestic cattle;

S = silvicultural investments to enhance timber productivity (e.g., planting of seedlings, thinning);

R = investments in range improvements; and

H = the harvest of wildlife via hunting.

It is assumed that the costs of S and R are incurred by loggers and ranchers, respectively.

There are a number of groups in society that use the range resources, and each group has its own objective function. The groups can be identified as ranchers, loggers, hunters and preservationists. Ranchers are interested in high stocking rates and range improvements. Loggers are primarily concerned about commercial timber volume and silvicultural investments, and are interested in domestic or wildlife grazing only to the extent that these are beneficial or harmful to timber production. The focus of hunters is upon the numbers of big game available (which affect success rates) and bag limits (H), while preservationists are interested in all aspects of the range, but particularly the amount of vegetation (V plus TM) and the numbers of wildlife. To make the model more manageable, preservationists and loggers are excluded from the remaining discussion.[1]

The objective functions of the two remaining groups (ranchers and hunters) are presented in equations (1) and (2).

$$\begin{gathered} \mathit{Max}_{C_t,R_t} \sum_{0}^{T-1} f^1(C_t,R_t)\ \beta^t + r(I_T) \\ \frac{\partial f^1}{\partial C_t}>0 \quad \frac{\partial f^1}{\partial R_t}<0 \quad \frac{\partial r}{\partial I_T}>0 \end{gathered} \tag{1}$$

$$\begin{gathered} \mathit{Max}_{H_t} \sum_{0}^{T-1} f^2(W_t,H_t)\ \beta^t + h(W_T) \\ \frac{\partial f^2}{\partial W_t}>0 \quad \frac{\partial f^2}{\partial H_t}>0 \quad \frac{\partial h}{\partial W_T}>0 \end{gathered} \tag{2}$$

In the above, t ε [0,T-1] and β is the real discount factor. While β might vary among groups, it is assumed that this is not the case; indeed, the private rates are assumed to be equivalent to the social rate for simplicity. The functions r and h refer to the values of the rangeland to each of ranchers and hunters, respectively, at the end of the time horizon--the salvage value of the land for each of the groups.

The respective state transformation equations (equations of motion) for forage biomass, wildlife and the stock of range improvements are given by equations (3), (4) and (5).

$$\begin{gathered} V_{t+1} = g^1(V_t,\ I_t,\ R_t,\ C_t,\ W_t) \\ \frac{\partial g^1}{\partial V},\ \frac{\partial g^1}{\partial I},\ \frac{\partial g^1}{\partial R} > 0 \\ \frac{\partial g^1}{\partial W},\ \frac{\partial g^1}{\partial C} < 0 \end{gathered} \tag{3}$$

The state transformation equations are the production (interaction) functions for the range, and

---

[1] Conceptually, it is a simple task to specify objective functions for loggers and preservationists and include these in the social objective function (Eq. (6) below). Likewise, a state transformation function for timber can be specified and S and TM included in the appropriate functions. The problem becomes unmanageable only when attempting to solve it analytically or computationally.

$$\begin{gathered} W_{t+1} = g^2(V_t,\ C_t,\ W_t) \\ \frac{\partial g^2}{\partial V},\ \frac{\partial g^2}{\partial W} > 0 \\ \frac{\partial g^2}{\partial C} < 0 \end{gathered} \qquad (4)$$

$$\begin{gathered} I_{t+1} = g^3(I_t,\ R_t) \\ \frac{\partial g^3}{\partial I},\ \frac{\partial g^3}{\partial R} > 0 \end{gathered} \qquad (5)$$

it has already been noted how difficult it is to empirically determine these relationships. Therefore, no attempt is made to determine the signs of the second derivatives of the foregoing functions.

Whereas it is possible to determine optimality conditions for any one of the groups by ignoring use by other groups, the public manager of the forest rangeland must somehow balance the competing uses of the range. Therefore, the range manager's objective function can be represented by a utility function that balances the objectives of all the groups. One possibility is that the objective function is simply the summation of f^1 and f^2. In the current analysis, the public manager's objective function is specified as:

$$Max_{C_t, R_t, H_t} \sum_{0}^{T-1} U(f^1,\ f^2)\ \beta^{t} + \beta^{T}\, \Omega(I_T,\ W_T)\,, \qquad (6)$$

where Ω is the social value of the range at the end of the time horizon.

The discrete-time, current value Hamiltonian for problem (6), given constraints (3)-(5) is:

$$\begin{gathered} H(\ ) = U(f^1(C_t,\ R_t),\ f^2(W_t,\ H_t)) + \\ \beta\ \lambda_{t+1}\ g^1(V_t,\ I_t,\ R_t,\ C_t,\ W_t) + \\ \beta\ \mu_{t+1}\ g^2(V_t,\ C_t,\ H_t) + \\ \beta\ \theta_{t+1}\ g^3(I_t,\ R_t)\,. \end{gathered} \qquad (7)$$

In addition to the equations of motion (3)-(5), the first-order conditions require that:

(i)

$$\frac{\partial U}{\partial f^1}\ \frac{\partial f^1}{\partial C_t} + \beta\lambda_{t+1}\ \frac{\partial g^1}{\partial C_t} + \beta\mu_{t+1}\ \frac{\partial g^2}{\partial C_t} = 0$$

(ii)

$$\frac{\partial U}{\partial f^1}\,\frac{\partial f^1}{\partial R_t} + \beta\lambda_{t+1}\,\frac{\partial g^1}{\partial R_t} + \beta\theta_{t+1}\,\frac{\partial g^3}{\partial R_t} = 0$$

(iii)

$$\frac{\partial U}{\partial f^2}\,\frac{\partial f^2}{\partial H_t} + \beta\mu_{t+1}\,\frac{\partial g^2}{\partial H_t} = 0$$

(iv)

$$\beta\lambda_{t+1} - \lambda_t = -\,\beta\lambda_{t+1}\,\frac{\partial g^1}{\partial V_t} - \beta\mu_{t+1}\,\frac{\partial g^2}{\partial V_t}$$

(v)

$$\beta\mu_{t+1} - \mu_t = -\,\beta\lambda_{t+1}\,\frac{\partial g^1}{\partial W_t} - \beta\mu_{t+1}\,\frac{\partial g^2}{\partial W_t}$$

(vi)

$$\beta\theta_{t+1} - \theta_t = -\,\beta\lambda_{t+1}\,\frac{\partial g^1}{\partial I_t} - \beta\theta_{t+1}\,\frac{\partial g^3}{\partial I_t}$$

(vii)

$$\lambda_T = \frac{\partial \Omega}{\partial V_T}$$

(viii)

$$\mu_T = \frac{\partial \Omega}{\partial W_T}$$

(ix)

$$\theta_T = \frac{\partial \Omega}{\partial I_t}$$

Condition (i) states that the current marginal social utility of stocking cattle (1st term on the LHS of the equation) must equal the discounted marginal social opportunity costs (2nd and 3rd terms on the LHS). Likewise, the marginal social benefits of investments in range improvements must equal their marginal social costs (condition ii), and the marginal social benefits of hunting must equal their marginal social costs (condition iii). In each case, the marginal short-run benefits of the decision must be equated to the marginal long-run opportunity costs. The costate equations (iv)-(ix) represent the current values of the state variables. Condition (iv) states how the current value of range biomass changes over time, while conditions (v) and (vi) indicate how the current values of wildlife numbers and the stock of range improvements change over time. The respective values of these variables at the end of the time horizon are given by conditions (vii)-(ix). Finally, interactions among the activities (i.e., impacts of one activity upon the value and availability of the others) is accounted for by the partial derivative terms and the costate variables (via conditions (iv)-(ix) and the state transformation equations).

There are two ways in which private and social decisions might diverge in range management. First, if one is interested only in the rancher's perspective, conditions (i) and (ii) would become:

(i')

$$\frac{\partial f^1}{\partial C_t} + \beta\lambda_{t+1}\frac{\partial g^1}{\partial C_t} = 0$$

(ii')

$$\frac{\partial f^1}{\partial R_t} + \beta\lambda_{t+1}\frac{\partial g^1}{\partial R_t} + \beta\theta_{t+1}\frac{\partial g^3}{\partial R_t} = 0$$

The partial derivative of U with respect to f^1 is missing in (i') as is the partial derivative with respect to f^2 is missing in (ii'), while the last term on the LHS of (i) is no longer relevant. Thus, the optimal values of the decision and costate variables and the paths that the state variables take over time will differ depending upon whether a private or social perspective is taken. The divergence results because social valuation takes into account other values of the range--in this problem, wildlife values.

Next, if the authority provides annual grazing permits, ranchers have no guarantee for the future. Annual permits with no guarantee regarding future use of the range implies that $\lambda = \theta = 0$ in (i') and (ii'). Since vegetation left for next year has no value to ranchers in this circumstance, overgrazing occurs--the range is treated as a common property resource. Likewise, the stock of range improvements has no value under annual licensing and, therefore, there is underinvestment in range improvements. In B.C., ranchers are provided some security with regard to future use of the range. The foregoing result simply illustrates the importance of providing security via long-term leases or other institutional arrangements that offer the same guarantee.

AN EVALUATION OF PUBLIC PARTICIPATION IN THE BRITISH COLUMBIA MINISTRY OF FORESTS

Background Report Prepared for the
British Columbia Forest Resources Commission

By

Kim Brenneis

Natural Resources Management Program
Simon Fraser University

December, 1990

Quotations

> In every area, there is not a lack of willingness on the part of individuals and citizens' groups to participate and whether we like it or not, such participation is an irreversible fact in modern societies. And the only choice facing governments at all levels is whether to invite such participation at every stage of the decision-making process, in an atmosphere of co-operation, or whether to encounter participation after the fact, in an atmosphere of hostility. It is really no choice at all.
>
> Prime Minister of Canada (1978)*

> Participation is founded on the democratic maxim that those affected by a decision should have input into that decision
>
> (Smith 1982, 21)

---

* P.E. Trudeau, as cited by Chapin, H. and D.Deneau. "Citizen Involvement in Public Policy-Making".Ottawa: Canadian Council on Social Development, (1978). Quoted by Smith, (1982, p.21).

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Chapter One

Introduction

1.1 Background

The vast forests of British Columbia have traditionally played a significant role in the lives of the people who settled there. Initially trees acted as barriers to agriculture and travel. At the same time however, forests presented the new settlers with huge timber resources to exploit. Over the last one hundred years, forestry has played the dominant role in the provincial economy. The forest industry is the top revenue earner in British Columbia, with $11.5 billion earned in 1987, and is second in employment with 82,500 direct jobs (COFI 1988). Put into a national perspective, in 1987 the Province's forest industry was responsible for 53% of the logging activity in Canada, employed 43% of the national logging industry workforce and produced 35% of all value added forest products in Canada (Statistics Canada 1990). Beyond simply an economic contribution, forestry has played an important role in developing our society culturally. Forests mean more than employment and profits. They also provide a way of life.

A growing percentage of the public however, is not satisfied with forest management in British Columbia and in Canada overall. A national poll conducted in January 1989 noted that 63% of Canadians thought that ecological concerns should be paramount in forestry land-use decisions. In contrast, only 20% thought that employment and other economic factors, which typically guide most forestry decisions, should take precedence (McLaren 1989). The single use view of our forests as a source of timber is being challenged by numerous sectors of the public as timber resources decline. A common denominator of this high level of public dissatisfaction is that the public is frustrated with the lack of opportunity to participate. There are serious concerns with site specific issues, but there is also general anxiety regarding the decision-making process and the lack of opportunity for the public to participate. The decision-making process is the critical step in the management of our natural resources, and a public participation process is an accepted part of government (Smith 1982 and Parenteau 1988). Frustration over the lack of public participation opportunities is compelling the public to attempt to influence the decision through whatever methods possible, including public protests and civil disobedience.

In British Columbia's provincial forests, this frustration is most evident in the conflicts involving the forest industry and environmentalists in a debate over logging practices and preservation of wilderness areas. The fight to preserve as wilderness the Stein Valley, Clayoquot Sound and the Carmanah Valley, and the protests over logging on Saltspring Island are just a few visible examples of widespread public concern. However, these conflicts are not restricted to issues of preservation, and adversaries are not limited to the forest industry and the environmentalists. Forestry workers and their unions are concerned with declining employment in the industry. Small forestry companies are demanding increased access to the timber resource. Non-timber interests, especially tourism related industries, are concerned with the impact of forestry on their operations. Tourism is the Province's number one employer with 83,700 direct jobs and generates $3.5 billion in revenue, second only to forestry (COFI 1988). In addition, many people are concerned with the biological sustainability of the present use of our forests.

The demands for increased public participation opportunities have been heard for over two decades. In the 1960's, active participation in the civil rights movement in the United States extended into environmental issues. One of the results of the demands for greater environmental protection in the United States was the National Environmental Protection Act, which included a legal mandate for extensive public participation through environmental impact statements. In Canada, a similar legislated mandate for public participation opportunities has not been created. However, the requests for increased public participation have resulted in the incorporation of a number of opportunities for public participation into planning processes. The Berger Inquiry on the MacKenzie Valley pipeline in 1977 was an important step in the development of public participation in Canada. This inquiry illustrated the potential influence that the public could have on decisions and raised public expectations for future opportunities. Now in the 1990's, a steadily decreasing forest resource base coupled with a desire by the public to participate in decisions that affect their lives is resulting in increasing demands public participation opportunities. Increased public participation is not just a fad (Tipple and Wellman 1989).

1.2 Purpose and Objectives

The purpose of this study is to evaluate the effectiveness of the British Columbia Ministry of Forests (MoF) public participation program in providing meaningful opportunities for public participation in the planning and decision-making processes. The aim of this report is to act as a discussion paper on public participation in the MoF. Based on evaluative criteria and ideal components developed from the literature and practical experience, recommendations for improving opportunities for meaningful public participation in MoF are discussed. The specific study objectives include:

1. An examination of the theory of public participation. This includes identifying who the public is, why public participation is necessary, when and how it should occur, and criteria and components of a good public participation process.
2. An evaluation of public participation in the planning and management processes for crown resources from selected jurisdictions across Canada, the Northwest United States and the South Pacific.
3. A description of the public participation process within the MoF's planning process.

4. An evaluation of MoF's public participation process and recommendations to improve opportunities for public participation in the planning and decision-making processes of MoF, based on lessons learned from the theory and the jurisdictional review

1.3 Scope and Significance of this Study

A number of authors have noted that the evaluation of public participation should not be restricted to the process alone. The evaluative framework of Smith (1984) encompasses not only the process and product, but also the context in which the public participation process resides. This context involves the institutional arrangement where decisions are made, including the political and administrative structure. The institutional arrangement is typically ignored in the evaluation of public participation. Repeatedly, the focus of the analysis is on the specific public participation techniques used, and not on the basic principles (Fraser 1990). Parenteau for example, argues that:

> Participation implies democratizing choices involving the allocation of resources, decentralizing the management of services, taking bureaucratic decisions that affect citizen's lives out of the hands of professionals, and demystifying decisions on planning criteria and spending. Participation will remain incomplete as long as it does not embrace the material basis of the decision, the decision itself,...(1988, 63).

The goal of this paper is to analyze public participation in the decision-making process, in whatever institutional structure that participation process resides in, and to make recommendations to improve that process. An analysis of institutional reform is outside the scope of this report. However, this report sets the stage for further analysis of the most appropriate institution design of the decision-making process to include the public. This report offers an independent evaluation of MoF and presents basic components and principles that should be followed to ensure meaningful public participation for the citizens of British Columbia.

1.4 Methodology and Information Sources

In addition to utilizing recent literature on public participation and democratic theory, this evaluation reviews the public participation processes from a variety of jurisdictions. Both theoretical lessons and the practical experience are applied to the evaluation of the MoF public participation process.

A review of public participation theory was completed through an extensive review of the literature and through personal interviews with practitioners in the field. The evaluation of public participation processes from both the MoF and other jurisdictions was accomplished by reviewing original plans, manuals, and other documentation from the jurisdictions, and through interviews. In addition to British Columbia, the jurisdictions examined for this project include the remaining Canadian provinces and territories, the federal departments of the United States Forest Service (USFS) and the Bureau of Land Management (BLM) in the United States, along with the states of Alaska, Washington and Oregon. Finally, the public participation process of New Zealand and the province of New South Wales, Australia were included in this project.

1.5 Organization of the Research Project

This report consists of eight chapters. Chapter One provides background information and presents the purpose, objectives, scope and information sources for this research project. The theory of public participation, such as the definition, rationale and styles of participation are described in Chapter Two. Chapter Three examines the spectrum and timing of participation, as well as a brief outline of public participation techniques. Chapter Four outlines the components necessary for an effective public participation process. Chapter Five summarizes the evaluation of other jurisdictions. The MoF's planning process and the associated public participation process is described in Chapter Six. Chapter Seven presents the evaluation of the MoF's public participation process and offers a number of recommendations to improve the effectiveness of that process. Finally, a few summary remarks are made in Chapter Eight.

Chapter Two

The Theory of Public Participation

2.1 Definition of Public Participation

Numerous definitions of public participation are offered in the literature[1], due to the wide latitude of what participation involves. Smith, for example, defines public participation as "any action taken by an interested public (individual or group) to influence a decision, plan or policy beyond that of voting in elections"(1984, 253). Carole Pateman simply states that "participation refers to (equal) participation in the making of decisions. . . ."(1970, 43). Common factors in most definitions include the requirement for at least two way communication, and some level of empowerment of the public allowing them to influence the decision.[2] Arnstein states that "Citizen participation is citizen power" (1969, 216).

2.2 The Rationale for Public Participation

There are several rationales for increasing opportunities for public participation. First, government and the associated administrative structure has reached the size where it is unable to respond to individual needs (Smith 1984; Parenteau 1988). The distance between the decision-makers and those affected by the decision is too great. This results in a line of accountability for decisions that is so long that it has become blurred and the legitimacy of the decisions has become questionable. Parenteau notes that a "political and social vacuum" exists around large administrative structures, and public participation is needed for the "resocialization of these [structures]" (1988, 2). Second, greater participation is warranted because some members of the public do not like decisions which come from a "black box", where the decision-making process is unclear and not readily accessible (Knopp and Caldbeck 1990). The public wants to oversee and participate in the decision-making process. Third, specialized interest groups such as industry may have political and economic influence which can hinder government attempts to manage natural resources in the best interests of the public (Parenteau 1988).

---

[1] The act of including the public in the planning and decision-making process is known by various terms, such as public or citizen participation and public or citizen involvement. For the remainder of this report, the term public participation will be used for two reasons. First, the majority of authors in the literature use this term. Second, this author feels that the term participation embodies the true spirit of public participation, in that the public becomes part of the process and is not simply connected to the process. Participation is defined in Webster's dictionary (1984) as "The state of participating or sharing in common with others"(p.605), as compared to the definition of involvement, which reads "to connect by way of natural result or consequences"(p.456).

[2] Some of the authors that offer a definition include: Arnstein(1969); Dunster(1988); Parenteau(1988); Praxis(1988); Sadler(1978); Smith(1984); Stanbury and Fulton(1988).

The justification for public participation comes from a variety of sources and includes such issues as ethics, fairness, accountability and efficiency. An important factor to remember in the management of most natural resources is that these resources are publicly owned resources. The government acts as the structure or instrument of the democratic society. Therefore, it is the obligation of the MoF as a government agency to ensure that these public resources are used in the public's best interests, following the general public will and the best technical expertise available. The moral rationale for public participation is embodied in the simple rule "those affected by a decision should have input to that decision" (Smith 1984, 253). Sewell and O'Riordan express the same sentiment stating "in most democratic societies it is generally assumed that the individual has the right to be informed and consulted, and to express his views on matters which affect him personally" (1976, 1).

Parenteau identifies two basic rationales for public participation: political motives; and as a method of including the public in the decision-making process (1988). Gardner (1989) also separates the purposes of public participation into two general categories: political and functional. For this study, the division is made into two categories: functional and democratic rationales.[3] These categories are not mutually exclusive, but rather overlap significantly.

Political motives can be an important rationalization for public participation, although a government would not freely acknowledge this. Public participation processes can be used to enhance the government's image, to increase credibility with the public, and to legitimize the government's actions. The government gains legitimacy and protects their monopoly on decision-making power while at the same time they "diffuse political responsibility" (Stanbury and Fulton 1988). Public participation can also be used to dissolve the opposition to a decision by making the general public feel satisfied that they have participated, by winning over or co-opting the vocal opposition, or by delaying action on an issue until it is politically prudent. While it is necessary to recognize the existence of political motives, the discussion of this rationale is limited in this study because a public participation process established under this rationale is generally not in the public interest. This study will therefore focus on the functional and democratic rationales for public participation.

2.2.1 Functional Rationale

The functional rationale for public participation involves practical aspects of decision-making, such as costs and tangible benefits. This rationale includes such characteristics as efficiency, effectiveness, better use of the information and expertise that the public holds, and the education of the public regarding the process of decison-making and planning, all of which leads to better decisions. These functional justifications for public participation listed below are quite straightforward and easily accepted by politicians and practitioners, in comparison to the more abstract democratic rationale. The additional information or costs saved during the planning process as a result of public participation are tangible benefits. However, the functional rationale and the democratic rationale are quite strongly interrelated with each other and equally important. The functional rationale for public participation in decision-making includes:

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[3] These rationales come from a number of sources, including Dunster (1988), Praxis (1988) and Stanbury and Fulton (1988).

More effective decisions - A simple and very compelling rationale for public participation is that it can result in better decisions. The quality of the decision-making process is improved by the increased input and scrutiny, both from the public and from the government, that results from the participation process (Praxis 1988). A process is more likely to meet its original goals and objectives. As well, increased participation, especially early in the planning process, can avoid potential conflicts. As Gardner (1989) states: "public participation is not an end in itself but a means to better decisions". The end result is that the decisions are more acceptable to the public because they have participated in those decisions.

A more educated public - As noted earlier, participation by the public is an educational process involving the issues, the decision-making and democratic processes. An informed public is more prepared to assist in decision-making, will bring relevant information to the table and is less likely to initiate unnecessary conflicts.

Better use of public information and expertise - The public can offer the decision-maker two distinct sources of information. First, in the an era of shrinking government budgets and reduced technical support, the public can offer information and expertise that the government does not have. In addition, public participation is the best source for important information about values and an estimate of the public will. This additional information and expertise can lead to a more adaptable, capable process producing better decisions.

More efficient decisions - Common criticisms of public participation include the amount of resources used in the process and its role in slowing down the decision-making process. If these criticisms are considered valid, the additional cost to society could be considered a cost of democracy (Tipple and Wellman 1989). However, it is noted in the literature that public participation may actually increase the efficiency of natural resource management and planning.[4] While in the short-term the participation process may cost the agency additional time and resources, there may be a definite long-term savings from reduced conflict and reduced delay later in the planning or decision-making process. If the public participation process is perceived to be fair, then the public will be more committed to the decision and more likely to accept it. The agency also benefits from the additional information and expertise provided by the public.

2.2.2 Democratic Rationale

The democratic justification for public participation incorporates ideals such as ethics, morals, fairness and equity. However, the discussion of democracy involves two distinct theories of democracy: representative and participatory democracy. A more complete understanding of this distinction is vital in recognizing the importance of public participation.[5]

Modern Representative Democracy

Prominent theorists of modern representative democracy include Schumpeter, Berelson, Dahl, Sartori and Eckstein.[6] The origins of this contemporary theory of democracy are found in the turn of the century, where government had grown to a considerable size and complexity and large bureaucracies were being created. Although the ideal of democracy is the rule of the people through maximum participation, the size of governments had made that ideal impractical. By the middle of this century, the new ideal for democracy was representative democracy, allowing minimum participation by the public. This was viewed as a realistic arrangement. The general public was seen as apathetic to the workings of the government, and the only amount of participation required, other than by a small elite minority of elected leaders, was provided through voting in elections. The amount of participation considered necessary was the minimum amount needed to keep the electoral process running. Democracy was equated with a competition between leaders for the citizen's vote to determine the leader who would then represent the apathetic masses and the public will. It was believed that any increase beyond that level of participation would only lead to a destabilization of the system.

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[4] Refer to: Nelson 1982; Praxis 1988; Smith 1984; and Stanbury and Fulton 1988.

[5] For additional reading on democracy, refer to Knopp and Caldbeck (1990), McAllister (1980), Pateman (1970), Rosenbaum (1976) and Thornley (1977).

[6] Refer to Pateman (1970).

Participatory Democracy

Participatory democracy developed in response to the shortcomings of the modern representative system. The idea of pure democracy, where people actively rule themselves, was viewed as impractical by contemporary theorists. In our ever-growing society (in both size and complexity) the need for representatives in democracy is recognized. However, it is also recognized that power in the hands of a few is dangerous. It is impossible to expect a politician to be capable of distilling from the electoral vote the public will (which is composed of the aggregate of private interests of individuals) of the electorate on any particular issue, no less the desire of any one individual or portion of the electorate. The limitation of participation through voting, and the lack of accountability between elections is the main rationale for public participation (Stanbury and Fulton 1988).

Failings of the representative democracy become apparent when the government is considered as a quasi-market. In this market-type analysis of the political process presented by Anthony Downs, voting is seen as the method where individual values are translated into public action decisions. Government is viewed as a body of individuals whose goal is re-election or re-appointment. Acting as a quasi-market, the government is only interested in the citizen's vote or maximizing its own political support, and not necessarily in maximizing individual welfare. Therefore, the government is only interested in catering to the individual's ideas of welfare in so far as to capture his/her vote (Steiner 1977). The electoral vote traditionally encompasses a large variety or "bundle" of unrelated issues. The reliance on this infrequent vote to inform the government of public opinion on specific issues can lead to a discretionary nature of government. Steiner notes a list of negative characteristics of a system of government that relies on elections alone for guidance:

> [T]he variance in individuals' views; the fact that voters choose infrequently and among bundles of policies; the fact that many of the views are not held so strongly that a political leader who violates them is at once anathema; that many voters' preferences are inchoate, uncertain, and subject to change; that pressure groups can and do negotiate with governments; and finally that political leaders can, in fact, lead their followers on many issues (Steiner 1977, 58).

The key weakness identified above is that the voters choose among a bundle of policies and issues, and do so only infrequently. It is impossible for the politician to gain an understanding of the public will on a particular issue or an individual's opinion through the electoral process alone. The individual issues and their significance is blurred within that bundle. As noted by Steiner, "I think at present that we conceal so many issues and conflicts, both among objectives and among alternate means, that we increase the discretion of the policy-maker beyond that necessary or desirable" (1977, 64). What is needed is a system of checks and balances against the shortcomings of the purely representative system. Participatory democracy resides in a structure of representative democracy to provide the system of checks and balances. In addition to limiting the democratic representation to relatively small geographical electoral units, the most important check to that discretionary power is direct citizen participation.

Participatory democracy can be said to exist "when individuals have a known and quantifiable effect on the (resource allocation) decision" (Knopp and Caldbeck 1990, 15). The most important characteristic of participatory democracy is the involved citizen. "There is no doubt that the quality of the democratic government depends on an informed, active citizenry" (McAllister 1986, 35). In a participatory democratic society, an individual is a public citizen as well as a private citizen. In addition, it is believed that the individual knows what is best for him or herself, and the collective private will is the best definition of the public will. "It has been established that, in democratic thought, each adult is assumed to be the best guide to his welfare, and that all people are equally important in determining the public welfare" (McAllister 1986, 33). Therefore, it is the strong combination government and the participation of the individual that creates a good democracy. "The theory of participatory democracy is built around the central assertion that individuals and their institutions cannot be considered in isolation from one another (Pateman 1970, 42).

In contrast to the theory of representative democracy, public participation is viewed as vital to the stability of the government in participatory democracy. The public will be more inclined to support a system that they actively participate in. Participation encourages the government to incorporate all private interests, thus ensuring better decision-making. A key factor in this stability is the education of the citizen. By participating, the citizen becomes aware and involved in the issues that affect him/her personally, and at the same time becomes a democratic citizen, skilled in workings of democracy. Pateman recognizes this social education as the major function of public participation. "Thus there is no special problem about the stability of a participatory system: it is self-sustaining through the educative impact of the participatory process" (Pateman 1970, 42).

Another characteristic central to the theory of participatory democracy is equality. Each citizen has equal rights and each person's private welfare is equally important for defining public welfare. Individual freedom is important in participatory democracy and participation forces the individual to be free (Rosseau, as cited in Pateman 1970).

Based on this review of participatory and representative democracy, it becomes apparent that the democratic rationale for public participation stems from the characteristics of participatory democracy itself. These characteristics include:

Increased Democratic traits - The democratic criteria of equal representation, equity and accountability are, by themselves, sufficient rationale for public participation in government. Every member of the public has the right to participate in the decisions that affect him/her, and all positions should be considered. Public participation empowers the citizens in the decision making process. Equal representation involves adequate and timely notification and equal access to information and resources for participation. Public participation creates proportional representation in our democracy (not influenced by political or economic power). For example, good public participation opportunities allow those individuals with little economic power who typically do not have a strong voice in our market-driven society to influence the decision (Thompson 1980). Equity encourages that the benefits and costs of the decisions are distributed equally, and that avenues for resolving conflict and filing appeals are open to those citizens who perceive the decision to be unfair. The decision-maker should be democratically accountable and the decision-making process, objectives and goals must be understandable and acceptable to the public. As noted earlier, public participation increases the accountability of the government to the public. This is especially important to ensure fairness in typically discretionary decision-making.

Reduced conflict - Public participation can offer opportunities to reduce conflict. The public has an opportunity to influence the decision, gain a better understanding of the issues, the other participants and the government itself. Building an atmosphere of understanding, tolerance and compromise can lead to resolution of the conflict (Gardner 1989).

Increased individual and community development - The educational facet of participation can help to develop a more informed and understanding population. In addition, people gain a sense of community and partnership through a public participation process that shares the decision-making responsibility.

Increased stability - Participation in democracy can act as a stabilizing influence in society by educating the citizens and reducing frustration and conflict. Participation can allow the citizen to become part of the system and they are therefore more likely to support that system. This stability may not be apparent in the short term as new participation opportunities empower individuals and groups that traditionally held very little power to influence the decision. In the long term however, a more equitable distribution of the power and a greater understanding of the decision-making process can lead to a more stable and democratic society.

2.2.3 Summary of the Rationale for Public Participation

The main justification for allowing the public to participate in the decision-making processes of natural resources management is that it helps our society overcome the shortcomings of representative democracy.

> . . . broadened participation is desirable because it increases the representativeness and responsiveness of our administrative and political institutions, heightens citizens' sense of political efficacy, and acts as an important check on the abuse of administrative discretion.[7]

Demands for participation opportunities can be equated to demands for democracy, or more specifically demands for participatory democracy (Stanbury and Fulton 1988). The public wants to influence the decision-making process; they want power. Increased demands for participatory democracy does not appear to be a short-lived social trend but instead is part of a shift in societal attitudes. Naisbitt forecasted that the move from representative democracy to participatory democracy is one of the "megatrends" of the United States' society. These megatrends are not fads, but instead are part of the fundamental restructuring or evolution of their society (1982). Naisbitt notes that this trend is continuing on the schedule he predicted (1990). Participatory democracy threatens many people, especially those who now enjoy the favour of the governing elite. "Although [participatory democracy] is as old as the Greek city-state, participatory democracy has become a radical notion because it challenges the power and efficiency of centralized administration (M'Gonigle 1986, 303). A response to concerns regarding the challenge of the status quo is that we all share ownership of the public natural resources. Therefore, it is in the public's interest that we should make the best decisions possible. Both the democratic and functional benefits of public participation in the decision-making process justify increasing participation opportunities.

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[7] D.S. Cupps (1977). Quoted in Smith 1984, p.254.

2.3 Who is the Public?

The general principle in public participation is that there are many different groups and individuals that make up the public, and that the composition of the public changes from issue to issue and over time. "There is no such thing as "The Public", there are only publics . . . For any decision, the public consists of those people who see themselves as significantly affected" (Praxis 1988, 2:26). To make good decisions concerning public resources, decision-makers should consider the full range of societal values and opinions and utilize all sources of information and expertise. The public can not be restricted to the very vocal individuals and groups, or to those members of society who have traditionally enjoyed special access to the decision-makers. Limiting participation by ignoring one or more opinions would violate basic democratic principles (Fraser 1990). The public includes individual members of the public, industry and interest groups.

A pluralistic view of the individual assumes that in addition to individual beliefs, a person is influenced by a variety of commitments and values derived from the groups to which he/she belongs (family, political group, employer, interest group) (Steiner 1977). Therefore, interest groups such as environmental, business or industry, native, political or labour play an important role in the development of the public interest. A common concern exists about the representativeness of the interest groups during public participation. Do they in fact represent society's public interest, or that of a distinct special interest? If the interest groups do not represent the majority of society, public participation processes may in fact increase the influence of these groups (Stanbury and Fulton 1988). Berger, during the MacKenzie Valley Pipeline Inquiry, recognized this dilemma, stating that "They [interest groups] do not represent the public interest, but it is in the public interest that they should participate in the Inquiry" (1977, 255).[8]

Typically, public interest groups are distinguished from special interest groups. Special interest groups can be identified as those with a specific interest and those which may benefit directly from a particular decision. Such groups as industry, unions and even native groups are normally thought as special interest groups. Public interest groups are those organizations who attempt to represent a general public view, and will not directly benefit from a decision in the planning process. Environmental and civil rights groups can be classified in this manner. However, it may be beneficial to think of both special interest groups and public interest groups as simply interest groups. The distinction between the two types of groups is not as clear as it may appear initially. Some public interest groups may not be acting in the public interest or actually not have the support of a majority the public, even though they may think or claim they do. Many public interest groups have some special interest. In addition, the actions of many special interest groups may benefit the general populace and serve the public interest. Having acknowledged this, it is possible to appreciate the important role interest groups play in public participation, considering the nonparticipation by the general public. Interest groups can act as watchdogs or monitors for society in each of their areas of interest, and sustain a minimum level of participation during periods of low participation by the general public (Lucas 1977).

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[8] Berger, T.R. "The MacKenzie Valley Pipeline Inquiry." Queen's Quarterly, Vol.83, No.1. Quoted in Smith (1984, p.25).

Individuals may not participate for a variety of reasons. They may be unaware that they will be affected by the decision or feel that the impact is not significant enough. They may feel that an individual or a specific group already represents their views. Individuals may not believe that they can influence the decision or feel that the decision has been already made without considering their input (Praxis 1988). The nonparticipating segment of the public cannot be dismissed as simply apathetic, although some individuals may be. Many people will become involved only when the impact reaches a certain threshold and directly affects them. This threshold may be defined in economic, spatial or philosophical terms, and may explain the common occurrence of the "bandwagon effect" in public participation. As an issue or decision crosses the threshold of a number of individuals, the amount of participation increases dramatically. Once that particular issue is out of the spotlight or loses interest, the amount of public participation will decrease.

Society should be concerned in nonparticipation due to the inadequacies of the system, such as a lack of information or opportunities to participate in the decision or the restriction of public participation to the review of the decision or planning product. Levels of public participation, and conversely the levels of frustration felt by the public are significantly governed by the structure and operation of government and the decision-making processes (McAllister 1986). Based on the democratic criterion of equality, it is the responsibility of government to ensure that all members of the public have an equal opportunity to participate in the decision-making process.

2.4 Styles of Public Participation

Public participation can be characterized by four different styles or modes. Although Sadler (1980) views these styles as distinct stages during the development of public participation, Gardner (1989) notes that while each style emerged at different times during this development and was the predominant mode of public participation for that period in time, they are not mutually exclusive. All styles of public participation are still active today. A combination of Sadler's and Gardner's styles includes:

1. Participation by invitation.
2. Participation by intervention.
3. Participation by institutionalization.
4. Participation by initiative.

Participation by Invitation

Participation by invitation involves a closed process, where the government chooses the individuals and groups that they want to discuss specific issues with. Before the 1960's, participation by invitation was the typical style of public participation available. "Participation by invitation is the mirror of paternalistic government"(Sadler 1980, 2). Unfortunately, this type of public participation is anything but "public" or "participatory", involving only the decision-makers and a select number or privileged individuals who had special access inside the government. This style is dependent upon the government's perception of who has power and which individuals and groups the government wishes to consult. The only public participation that occurs with the general public in this closed system is a one-way flow of information to the public.

Participation by Intervention

This mode of participation emerged during the 1960's, born of dissatisfaction and frustration felt by the public regarding the closed style of decision-making, the lack of participation opportunities and the general poor management of the natural resources. Without an avenue to the decision-making process, the public resorted to a negative style of participation through protests, demonstrations and lobbying to disrupt or block resource development projects. Although the direct impact of this style of participation on specific issues was significant, it also changed the attitude of the government towards allowing and encouraging public participation. This style of participation still occurs today where groups feel dissatisfied with the management decisions or with the decision-making process itself, and feel there are still not sufficient avenues to participate in the system. The blocking of logging roads is an indication of this ongoing frustration.

Participation by Institutionalization

The shift into institutionalized participation in the 1970's was a response, in part, by the government to the public's participation through intervention. Governments established institutional participation processes in conjunction with the development of improved natural resource planning and management processes. One of the predominant areas of development for public participation opportunities was in impact assessment.

Participation by Initiative

Although the emphasis of this study is on the institutional public participation processes of the MoF, it is important to note the development of this newest mode of participation, which emerged in the 1980's. This mode of participation identified by Gardner (1989) involves members of the public establishing a mechanism to participate in an issue outside of the institutionalized decision-making process. A traditional example of this initiative is volunteering, with issues such as recycling, where only after initiative was displayed by the public and industry, did the government join the recycling trend. This style of participation is appealing to the public because they feel empowered as a result of their volunteer actions. Collectively, they believe that unified action at the "grass roots" or local level outside the government system is the best way to control the impacts influencing their lives. This local initiative, outside the government and the market, is called the "third system" (Gardner 1989).

Participation by initiative is undertaken for two reasons: first, because individuals want to take the initiative and will not wait for the government to act; and second, the public is frustrated by the lack of opportunities to influence the decision through the government established processes. The public believes that this style of participation is the best way to gain control over their lives and the local resources. The response to this frustration distinguishes participation by initiative from participation by intervention. Instead of staging protests and blockades to display their frustration, the members of the public look for opportunities to solve the problems without the government. Participants try to resolve the problem on their own instead of waiting for the government to act. An example of this style of participation is the Timber/Fish/Wildlife (TFW) Agreement in Washington State. In this case, frustrated by the lack of progress in resolving a century-old conflict involving fish habitat, forestry activists and native fisheries, native groups, environmentalists and the timber industry initiated negotiations. The state government joined the negotiations only after it was initiated, and even then participated only as an equal party. The result of this non-governmental initiative was the TFW Agreement that to date is successfully directing the management of the timber and fishery resources.

Conclusion

As noted earlier, each of the styles of public participation emerged at different times over the last 30 years, yet each one continues to exist today. Participation by invitation is still prevalent, but is arguably not very democratic. Participation by intervention may appear to be a very negative form of participation, although the effect of emphasizing the deficiencies in the decision-making process may be very positive and healthy in a democratic society. Participation by initiative is a promising area for directing participants' energies, however an examination of this style of participation is not the aim of this report. For the remainder of this paper, the emphasis will be on analyzing institutional methods of public participation.

Chapter Three

Practical Aspects of Public Participation

3.1 Spectrum of Public Participation

Public participation is traditionally classified by the degree of decision-making authority vested with the public. By varying the amount of decision-making authority delegated to citizens, a variety of levels, degrees or types of public participation is generated. The public should be empowered to some degree, exerting some level of influence on the decision-making process and thus allowing meaningful participation to exist. Empowerment can lead to shared responsibility, commitment to the process and trust.[9] Arnstein states that there is no public participation without some level of citizen power (1970). Without some transfer of decision-making authority, the public is not truly participating in the decision-making process, but merely acting as an informed spectator.

Arnstein proposed a "ladder" or spectrum of public participation based on the degree of citizen power (Arnstein 1969). The ladder consists of eight levels or rungs which are divided into three general categories of degrees of public participation: non-participation; degrees of tokenism; and degrees of citizen power (figure one). At the bottom of the ladder, *manipulation* and *therapy* are categorized by Arnstein as non-participation, and generally correspond to public relations exercises. These forms of participation do not represent real attempts to involve the public and the goal of public participation at this level is to pacify, or at best educate the public. Examples of this type of non-participation include placing public representatives on advisory committees and organizing cultural activities.

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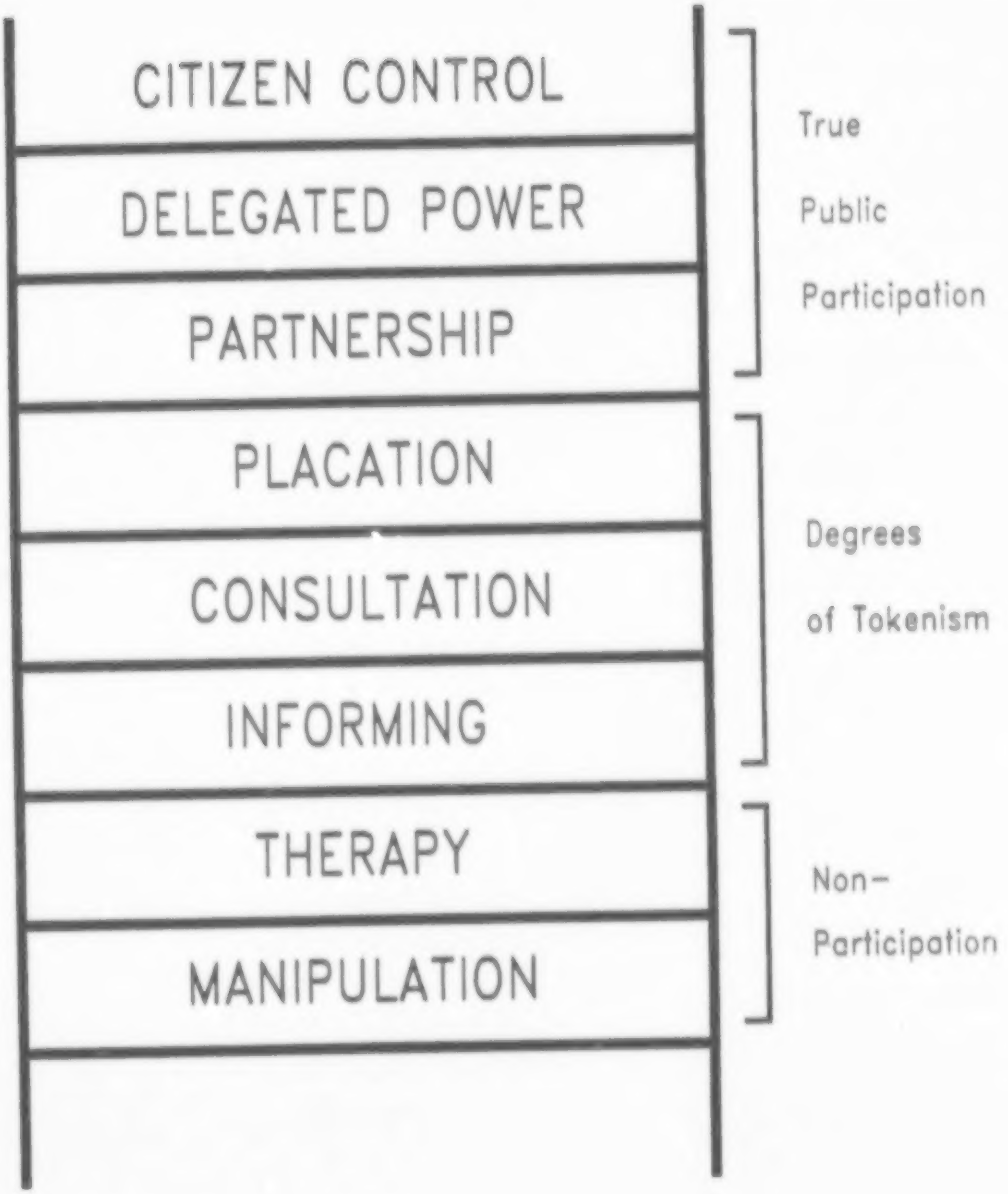
[9] This requirement of empowerment for true public participation is held by a majority of authors, including Arnstein (1970); Dunster (1988); Fraser (1990); Parenteau (1988); and Stanbury and Fulton (1988).

Figure 1 Ladder of Public Participation


CITIZEN CONTROL
DELEGATED POWER
PARTNERSHIP
PLACATION
CONSULTATION
INFORMING
THERAPY
MANIPULATION
True Public Participation
Degrees of Tokenism
Non-Participation

Source: Modified from Arnstein 1969: 217

The next three levels of the ladder, *information*, *consultation* and *placation* are categorized as degrees of tokenism. Information involves only one-way communication from the agency to the public with no opportunity for public response. Examples of this include media releases, newsletters, and informational meetings. Consultation and placation offer an opportunity for the public to have a voice in the process, although they may have no direct impact on the decision. The public is allowed the opportunity to give their opinion (consultation) or to act as an advisor (placation). Arnstein views consultation as a "window-dressing ritual" which only provides the public with an opportunity to have "participated in participation" (1970, 219). Consultation, including public meetings and hearings, surveys and polls are currently the most prevalent forms of public participation. Placation is not much more effective. The degree of influence that the public will has in this advisory role is limited and any amount of influence that they do gain is dependent on the quantity and quality of technical information, expertise and amount of persuasive powers they possess (Arnstein 1970; Parenteau 1980). The only way that consultation and placation can be considered as effective forms of public participation is for them to include some level of monitoring and feedback (Parenteau 1988).

True public participation occurs in the last three levels of public participation where power is allocated to the public. *Partnership* involves the sharing of decision-making power and is accomplished through a process of negotiation or bargaining. Examples of partnership arrangements include joint planning boards and other mechanisms that resolve conflicts. These structures are most effective when the public representatives are accountable and sufficient funds exist to enable equal participation. *Delegated power* refers to public participation where the public has received or negotiated the majority of the decision-making power, or enjoys the dominant role. With delegated power the public holds a majority of the vote on planning boards or committees. The top rung of the public participation ladder is *citizen control*. At this level, the public has full authority. Citizen control permits citizen committees to carry out the actual decision-making.

3.2 Comprehensive Public Participation Opportunities

The timing of public participation during the planning or decision-making process is critical. The public should participate at all stages of planning, especially during the early stages of the planning process, where the public has traditionally been absent.[10] This is particularly true at the normative (value setting) and strategic (goal setting) levels of planning which occurs early in the planning process, involving the development of policy and guidelines. These overall values, goals and policies, traditionally developed with no public input, guide all subsequent operational or site specific planning. As noted earlier, the management of public resources should incorporate the public's point of view and values. This is most easily accomplished by incorporating public participation directly into the upper levels of planning.

At the operational level of planning, the public is not traditionally allowed to participate until late into the process. As a result there is often little public input in establishing terms of reference, developing options, drafting plans and making final decisions. Consultation with the public then becomes adversarial and the public participation process is restricted to reviewing nearly completed plans and setting terms and conditions for the project (Knopp and Caldbeck 1990; Parenteau 1988). Participation becomes focused on the details of the project and not on the larger question of the project itself. A consequence of this preoccupation with details is that both the public and government have become heavily dependent on technical experts (Parenteau

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[10] Please refer to Knopp and Caldbeck (1990); Nelson (1982); Parenteau (1988); Praxis (1988); Smith (1982); and Stanbury and Fulton (1988).

1988). The public should be involved at all stages of the operational level of planning, to identify the issues and develop terms of references and options, and to give input on the choice of one of those options. The public should also be involved at the last stages of the project, during implementation and monitoring, to give them the opportunity to follow-up on their contributions and receive feedback. As the public recognizes positive effects of their participation, they will become more committed to the overall process.

3.3 Public Participation Techniques

A variety of techniques can be used to accomplish the goals of a public participation program, and no single technique is the best in any particular situation. Each technique can be effective or ineffective depending on how it is used, the particular situation and even the practitioner. In addition, no one technique fits neatly onto one rung of the participation ladder. Utilizing a variety of techniques establishes the best opportunity for public participation (Praxis 1988; Smith 1984). For instance, some information techniques combined with consultation and negotiation techniques may be the right mix to offer the public a good opportunity to influence the decision.[11]

Public participation techniques are often divided into approaches or categories. These categories are based on the degree of public participation, not unlike the division on Arstein's ladder. The list of six approaches or categories of techniques below was compiled from Lang and Armour (1980) and Praxis (1988).

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[11] Further details on public participation techniques can be found in documents such as Praxis (1988), Lang and Armour (1980), and the Public Involvement Handbook of the MoF (1981).

1. Public Information.
2. Public Information and Feedback.
3. Consultation.
4. Extended Involvement.
5. Joint Planning.
6. Delegated Authority.

Table one comprises a list of these categories and a selection of the main public participation techniques used in each. It is important to remember that the techniques are not restricted to the category in which they are listed. For example, workshops can be used for consultation, extended involvement or joint planning, depending on their structure and function.

Public Information - Techniques such as news releases, newsletters and position papers allow only for one-way communication from the agency to the public, the goal of which is to keep the public informed. Public information techniques are usually used in support of techniques from other approaches.

Public Information and Feedback - Techniques such as public surveys, polls and public submissions and briefs allow the public to provide information to the process, but cannot be considered two-way communication or dialogue. Public information techniques, with or without any feedback, cannot be considered any higher than the information level on Arstein's ladder of public participation.

Consultation - Techniques allowing two-way communication are the most frequently used participation methods, and include public meetings and hearings, open houses, workshops, open phone lines, simulation games and conferences. The public is allowed to express their views,

Table One Public Participation Techniques

Degree	Techniques
Public Information	- advertisements - newspaper reports, news releases - newsletters and other publications - reports or position papers - displays and exhibits
Public Information Feedback	- Public surveys and polls - community profiles - public written submissions in response to position papers and reports - tours - request for briefs from public
Consultation	- public meetings and hearings - opens houses - workshops and conferences - phone lines - simulation games
Extended Involvement	- advisory committees - workshops - task forces - co-management arrangements
Joint Planning	- joint planning teams - negotiation, mediation and arbitration - workshops - co-management arrangements
Delegated Authority	- citizen controlled group

but the government has no responsibility to incorporate the public opinions; the public gain any significant power to influence the decision. The most popular method of consultation is the public meeting, which offers a simple and direct opportunity to allow the public to voice their opinions. However, public meetings can become "captured" by one or more dominant interest groups, and the message to the government may not accurately reflect the general public opinion. Public hearings are another favourite method of consultation, but they have a number of shortcomings. They are expensive to operate, and the formal nature of hearings can intimidate participants, favouring technical experts and those groups who can afford such expertise. Financial barriers that the public must overcome in the public hearing process may justify the provision of intervenor funding to enable participants to operate on an equal footing.

Extended involvement - This category includes such techniques as advisory bodies, task forces or workshops, which continue over longer periods of time and require the support and commitment of the public and the agency (Praxis 1988). One of the more recently developed techniques at this level of participation is co-operative management, or co-management as it is more commonly known. Co-management arrangements involve sharing the responsibility of managing a resource or geographical area between the government and a user group. A set of general criteria for a co-management system includes:

1. An institutional arrangement between the user group and the government for a specific resource or geographical area.
2. A redistribution of the decision making power from the government to the user group. This redistribution may go beyond simply bestowing an advisory role on the user group.
3. Shared management responsibilities.
4. A system of rights, obligations, rules and a method to make collective decisions.

According to the definitions of co-management in the literature, decision-making power offered to the public by co-management arrangements ranges from user groups having simply gained an advisory role (placation on Arnstein's ladder) right up to self-management by the citizen group (level seven - delegated authority). However, co-management stops before reaching self-government. Typically co-management arrangements have been utilized with native land claim agreements, such as the James Bay agreement and the Inuvialuit Final Agreement and in the management of some coastal fisheries involving natives and non-natives alike.[12]

Joint Planning - Consensus building techniques such as negotiation, mediation and arbitration are especially important in joint planning arrangements. This approach includes joint planning teams, workshops and co-management arrangements (noted above) and allows for the possibility of consensus building between all the participants in the process. However, it is imperative that all parties come to the table with relatively equal levels of bargaining power, otherwise true partnership is impossible. Joint planning is situated at the partnership level of Arnstein's ladder.

Delegated Authority - Techniques for delegating authority include the creation of citizen committees or boards. These organizations, which typically occur at the local level, are transferred some or all of the authority and responsibility to complete planning (level seven on Arstein's ladder). The citizen body must have sufficient resources and expertise at its disposal to operate effectively and remain democratically accountable (Lang and Armour 1980). If ultimate authority is transferred to the public, either through a self-government arrangement or by bestowing a public body with veto power over decisions, the arrangement has progressed beyond a public participation approach to citizen control.

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12 For further details on co-management, the reader is encouraged to refer to: M'Gonigle (1989); Osherenko (1988); Pinkerton (1988; 1989a; and 1989b).

Chapter Four

Components of a Good Public Participation Process

The evaluation of the MoF's public participation process in this study is based on the identification of components of an effective public participation process. The components satisfy democratic criteria such as equity, accountability and representativeness, and functional criteria such as efficiency, effectiveness and acceptability. The existence of these components or characteristics of a public participation process helps to ensure better opportunities for the public to participate. The list of components below was derived from the literature, and include the desired components of an effective public participation process:

1. Legal Mandate.
2. Understandable Process.
3. Democratic Accountability.
4. Comprehensive Public Participation Opportunities.
5. Proper and Adequate Notification.
6. Access to Information.
7. Adequate Resources for Participation.
8. Written Responses.
9. Conflict Resolution Mechanisms.
10. Appeal Mechanisms.
11. Commitment.

Legal Mandate

One of the most important criteria of a good public participation process is that the right to participate must be legislated.[13] The right to participate and the level of influence ultimately given to the public is often set only in policy and left to the discretion of the minister or agency, which may mean that the public only acquires the opportunity to participate in participation, and not in the decision-making process itself (Lucas 1976). "In matters affecting the rights and interests of provincial residents, fairness, certainty, and predictability are best served through a comprehensive legislative foundation" (BC Ombudsman 1988, 30). Legislation should set rights, responsibilities and standards or ranges of permissible limits for public participation. This includes many of the components listed above, such as participation opportunities at all levels, intervenor funding, access to information and the right to appeal. With a legislative foundation of responsibilities and requirements, the public is provided with a standard to measure the governments' performance. The government is also made formally accountable through legal avenues (the courts). A legal mandate for public participation can instill public confidence in the process and make the process more credible to participants.

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[13] BC Ombudsman (1988); Hammond (1989), Lucas (1978); Man and Resources (1974); Parenteau (1988); Smith (1984); and Thompson (1980).

Understandable Process

Public confidence in government increases when all aspects of the decision-making process and opportunities for public participation are understandable. One of the largest barriers to public participation is a lack of understanding of the decision-making process, and misconceptions of the extent of public influence in decision-making. Therefore, it is imperative that all aspects of the decision-making process are clear, understandable and available to the public, and that the objectives and priorities for the planning and public participation process are made clear before the process begins. This includes clarifying the full range of actions, opportunities and outcomes that are permissible. Governments should establish priorities, objectives and limitations only after consulting with the public (BC Ombudsman 1988; Fraser 1990). By consulting with the public, some flexibility can be incorporated into the participation process within established limits, thus more closely matching actual levels of participation to levels desired by both the government and the public (Thompson 1980). The public will gain a better understanding and appreciation of a process that they helped to develop. The number of unnecessary conflicts resulting from misunderstandings can be reduced when the process is clearly explained and understood by the public. This description could be accomplished through a public document outlining the structure of the agency, the decision-making process and what the public participation opportunities are and when they occur.

Democratic Accountability

Public participation provides opportunities for the public to influence decisions. In some cases, members of the public may gain joint or complete decision-making authority. The basic democratic belief that must be adhered to is that decision-makers remain democratically accountable, and this accountability be clearly visible. If the decision-making authority is transferred to an unaccountable member of the public or public group, such as an unelected interest group, then the public participation process decreases the accountability of the decision-making process and in fact may undermine the democratic system.

Comprehensive Public Participation Opportunities

It is desirable that the public be given the opportunity to participate in all stages of the planning process.[14] They should be involved as early as possible, and be given adequate notification to prepare.

Policy Level - Involving the public at all levels of the planning process includes public participation in the development of policies, goals and guidelines (normative and strategic planning). This level of participation is typically absent in resource planning.

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[14] Most authors advocate this position, including: Knopp and Caldbeck (1990); Parenteau (1988); Smith (1984); Stanbury and Fulton (1988); and Thompson (1980).

> In the strategic planning area...the role of the citizen and of representatives of key interest groups is critical. Here we are dealing with perceptions of what is socially desirable, with topics that are value-laden, topics which would benefit from a wider view (Nelson 1982, 242).

Results of normative and strategic planning (values, goals, and policies) guide planning at the operational level. Given the democratic belief that the public should participate in establishing the management direction for publicly-owned natural resources, and considering the significant guiding influence of normative and strategic planning on the lower levels of planning, the public should participate in policy development. However, because of the abstract, long-term nature of the decisions made at this level, public input at this level is best provided by a member of the public who has sufficient time and interest to participate in the process and who aims to represent the views of the general public.

Public participation methods commonly used in policy development include political lobbying, "green" paper style discussions or workshops, public advisory bodies and inquiries (Smith 1982). Lobbying is a popular and significant method of public participation at the policy level. However, because it is not a formal method of institutionalized public participation (established by the government), it will not be expanded upon further in this report. Public inquiries are another traditional method and are very popular in Canada. Inquiries can be effective in allowing the public an opportunity to participate, but they are expensive to operate and quite formal, and thus may not be suitable for frequent public participation.[15] Smith (1982) suggests that a combination of advisory bodies at the ministerial level and green papers at the bureaucratic level offers the most substantive public participation opportunities. To act as a competent public participation opportunity, the advisory body must include full representation of public interests, and not be restricted to those public groups traditionally consulted. In addition, to maintain its integrity in the advisory role, the advisory body should remain independent from the government (Smith 1982). To maintain this independence, membership of the public advisory body should not include government staff. In addition, the membership should be either elected by the public or appointed by the government from a list of public recommendations. The advisor body should not take direction from the government, and should be supplied with adequate funding. "Green paper" style workshops allow for general public discussion of a policy paper. To ensure that the public is not be simply reviewing established resource use options or issues, the workshop should allow the public identification of issues and development of options. The process should receive sufficient funding and be structured to allow access by all interested individuals and groups.

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[15] There are some important characteristics of the inquiry that must be addressed to ensure a successful process. Refer to Berger (1977) or Smith (1982).

Operational level - At the operational level (involving the planning process for a specific area) the public should be involved in all planning steps, such as identifying the issues and areas of concern, developing and choosing between the resource use options, implementing and monitoring of the plan. By allowing this comprehensive participation from the beginning through to the end of the process, the public becomes an integral part of the planning process and the government displays its commitment to the public participation process. The public should participate in all steps of the planning process, from the development of terms of reference to monitoring the implementation of the plan.

Proper and Adequate Notification

The public should be made aware of the decision-making process and opportunities to participate in that process. An agency cannot assume the public has full knowledge regarding the participation opportunities or necessarily taken the initiative to discover them. To ensure a full representation of all interests, governments should provide adequate notification to all parties regarding the structure of the process and participation opportunities afforded by it. This notification could occur in a general way through the public document prepared by the government outlining the overall process. In addition, public notification of specific public participation opportunities should be given before each participation event, allowing the public sufficient time to prepare.

Access to Information

Effective public participation requires access to all relevant information used during the decision-making or planning process. The lack of information is cited as one of the key factors causing conflicts in resource planning and restricting participation in the decision-making process.[16] The right to information must be secured in legislation, and this legislation should endeavor to make information more accessible rather than legislating inaccessibility. "As a general rule, public information should be public" (BC Ombudsman 1988, 32). In addition, responses to requests for information should be provided in a timely fashion. All information that is used in a decision should be public information, and shared by all parties. Some confidential information must remain private, although the rules for confidentiality must be restricted and clearly defined. A general rule has been suggested: "Trade secrets or confidential business information should be exempted from disclosure, except where specific information is severable, or when the public interest regarding health, safety or environmental protection overrides private commercial interest" (BC Ombudsman 1988, 33).

Adequate Resources for Participation

Government, industry and even some interest groups have an unfair advantage in the participation process. The general public often lacks the resources to participate on an equal basis. Without sufficient funds, their participation is restricted or even impossible. The absence of certain members of the public due to a lack of funds would be an injustice to our democratic system, and would confirm that participation in our democracy is regulated by wealth. Intervenor funding helps overcome this inequity.[17] Funding allows public participants to access the public participation process and hire the expertise to participate effectively in the process. The value of intervenor funding was displayed during the MacKenzie Valley Pipeline Inquiry, by ensuring participation of the natives, a traditionally voiceless group in society. To stop the misuse of money, funding should be allocated under a set of criteria governing eligibility, and monitored through a system of checks.[18]

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[16] See: BC Ombudsman (1988); Man and Resources (1974); Parenteau (1988); Praxis (1988); Smith (1984); Stanbury and Fulton (1988); and Thompson (1980).

Written Responses

The public should receive feedback from their input and know reasons for a given decision. The best method to accomplish this is through written responses to the participants.[19] A written record and response, either directly to each individual participant or in a summarized form, gives the public something to gauge the performance of decision-makers (BC Ombudsman 1988). This could increase the accountability of the public participation process, by assuring the participants that their input is heard. Even though some of the participants may not agree with the decision, verification of the consideration of their input and the provision of reasoning for the decision may satisfy the public that the process was democratic, and that all factors were weighed in the decision.

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[17] Intervenor funding was advocated by: Berger (1977); Lucas (1976); Man and Resources (1974); Niezen (1987); Parenteau (1988); Smith (1984); and Thompson (1980).

[18] For details on intervenor funding, refer to Parenteau (1988), Thompson (1980), and especially appendix 1 of Berger (1977).

[19] BC Ombudsman (1988); Sadler (1980); and Stanbury and Fulton (1988).

Conflict Resolution

An important component of a successful public participation process is a conflict resolution mechanism.[20] The importance of such a mechanism is apparent when the number of conflicts that arise in resource management and the high costs of litigation are considered. In addition, mediation and negotiation usually involve the public at the partnership level of participation (Arnstein's ladder). The public participant holds fairly equal levels of power with the government. As suggested by the Provincial Ombudsman, it may be prudent to establish a mechanism for conflict resolution within natural resources planning and management processes (1988). An independent organization could be established to offer assistance and possibly provide neutral facilitators and mediators. In contrast to the appeal process, this process should be strictly voluntary. Conflict resolution will not be successful unless the parties enter into negotiations voluntarily, all interests are present, and each group has some degree of bargaining power and an interest in resolving the dispute through positive methods (Dunster 1988; BC Ombudsman 1988). By establishing a conflict resolution body, government, industry and the general public are offered an accessible solution to conflict.

Appeal Mechanisms

Related to the level of empowerment of the public through the public participation process is the right to appeal the decision rendered. The right to appeal is an important check to discretionary decision-making authority, and thus an important component of a public participation process.[21] While a complete analysis of appeal processes is beyond the scope of this study, a brief discussion of a number of the important requirements for an effective appeal mechanism is beneficial.

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[20] Conflict resolution is advocated by such authors as: Amy (1987); BC Ombudsman (1988); Dunster (1988); Niezen (1987); Praxis (1988); and Stanbury and Fulton (1988).

[21] Refer to BC Ombudsman (1988), Fraser (1990) and Man and Resources (1974) for the arguments for the right to appeal.

It is imperative that the appeal procedures be easily accessible and understood by the public, and be open to all members of the public. The Provincial Ombudsman recommended a two-stage appeal process, allowing the resolution of disputes at the most informal, cost-efficient setting (1988). The first stage of appeal would encompass an internal or administrative review, that resides within the government or specific agency. A requirement would be that the decision be made public. If one or both parties are dissatisfied with the decision of the internal review, then the appeal can taken to an independent appeal body established within a legislative framework. This level should include the right to counsel, adequate notification and right to written reasons for the decision. In addition, the appeal body should have the authority to make rulings, call witnesses and include sufficient expertise in natural resource management and practices of administrative fairness (BC Ombudsman 1988).

Any restrictions on the right to appeal and on the powers of the appeal body must be clearly defined. For example, the appeal body should have the authority to make rulings and not be limited to an advisory role. However, the appeal bodies authority should not include the power to change planning and management decisions, only return them to the appropriate agency. The appeal body is not democratically accountable and does not have the expertise to undertake a full analysis of the issue before rendering a decision.[22] The appeal board should not assume the management role of the resource agency.

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[22] Nor should the appeal body contain the same level of expertise as the management agency. Such a duplication of resources and duties would be very inefficient.

Commitment

Commitment is more difficult than other components to comprehend and appreciate. However, no other component can destroy the credibility and effectiveness of the public participation process as efficiently as an apparent lack of commitment by the government. Even the perception that the process is not valued by the government could destroy the effectiveness of the public participation process. "Public participation must be an integral part of the project planning process" (Praxis 1988, 1:19). It is vital that the government show commitment to the process by providing an adequate level of funding, staffing and technical resources.[23] Practitioners of the public participation process must be energetic and enthusiastic about the process. Commitment must also be an on-going, permanent part of the process, that extends from practitioners right up to the senior levels of management. If upper level management lacks commitment, then this lack of commitment will influence all other components of the process and become apparent to the public (Praxis 1988).

Commitment is also a product of an effective, mandated public participation process. Without the structure of an adequate decision-making process and public participation process in place, the level of commitment that is given by the practitioners can be limited. Therefore, commitment from the practitioner or from the government in the form of money or enthusiasm is not sufficient. The commitment from the practitioners must be accompanied by the development of a good public participation process, based on the other components. This includes a legally mandated public participation process, the right to appeal and access to information. Without permanent improvements to the public participation process, commitment by practitioners is undermined.

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[23] The importance of commitment in public participation is highlighted by: Fraser (1990); Knopp and Caldbeck (1990); Niezen (1987); Parenteau (1988); Praxis (1988); Sadler (1980); and Stanbury and Fulton (1988).

Chapter Five

Review of Public Participation in Various Jurisdictions

Public participation in the management and planning of natural resources is in a period of evolution and development. As a result of changing attitudes towards participation in democracy and an ever shrinking natural resource base, the public is demanding increased and improved opportunities to participate in the decisions that affect them. Governments are struggling to provide solutions for these demands, and numerous jurisdictions have made improvements to their public participation processes.

A review of MoF's public participation process cannot originate solely from a theoretical basis, but must include practical experience from other jurisdictions. Several public participation processes within public land use and natural resource planning and decision-making processes were reviewed. The jurisdictions included all provincial and territorial governments in Canada (British Columbia is not included in this jurisdictional summary). In the United States, the two major federal resource agencies, the United States Forest Service (USFS) and the Bureau of Land Management (BLM) were reviewed, along with the northwestern states of Alaska, Washington and Oregon. Finally, the review included the province of New South Wales in Australia, and New Zealand. In total, eighteen jurisdictions, not including British Columbia, were reviewed for this research project.

Some characteristics are common to the jurisdictions within each country. Legislation ensuring public participation opportunities is lacking in most of Canada. Six of the nine Canadian provinces reviewed here do not have legally mandated public participation. By comparison, all the United States jurisdictions reviewed (except Washington State) and both New Zealand and New South Wales require public participation. The resource planning system in the United States is dominated by legislation, with the legal requirement for environmental impact statements (EIS) accompanying most projects that may impact the environment. The EIS is the main vehicle for public participation in the United States. The federal legislation in the United States that requires EIS's and ensures public participation opportunities is the National Environmental Protection Act of 1970. A related characteristic of public participation in the United States is access to the courts. The public has the standing to take legal action against any governmental department that fails to follow the statutes (Vance 1990).

The environmental and natural resource structures of New Zealand and New South Wales have undergone major revisions during the 1980's. Both countries have developed new institutional structures and processes to improve management of their resources and have used extensive public participation throughout the development of these new structures (Grzybowski 1989a&b and Penny 1990). In addition, the restructuring allows for defined public participation opportunities and the right to appeal. One of the principles for the restructuring of the New Zealand system was that "decision-making processes and public subsidies should be made transparent through extensive public participation" (Grzybowski 1989a, 8). Although the details of this institutional restructuring are important, as noted earlier the larger question of institutional reform is beyond the scope of this report. However, the review of public participation processes in these jurisdictions strengthens the argument for the components identified in the literature.

5.1 Components

This chapter does not attempt to describe in detail the public participation processes within each jurisdiction. Instead, it emphasizes significant components of a public participation process, found during the review of these jurisdictions, that make the process more effective. The prominence of the components in the jurisdictions will be noted and the experiences of a number of the jurisdictions expanded on (refer to Table Two for a summary of the jurisdictional review). The components found during the jurisdictional review are, for the most part, a subset of the components identified during the literature review. Advisory bodies have been already recognized as an important public participation tool. The practical experience from the jurisdictions highlights the value of these advisory bodies in their own right. The eight components identified during the jurisdictional review include:

1. Legal Mandate
2. Comprehensive Public Participation Opportunities
3. Access to Information
4. Adequate Resources for Participation
5. Written Responses
6. Conflict Resolution Mechanisms
7. Appeal Mechanisms
8. Advisory Bodies

Legal Mandate

In twelve out of eighteen jurisdictions reviewed, public participation is legally mandated, although this requirement in Alberta applies only during reviews of energy projects undertaken by the Energy Resources Conservation Board (see Table Three for the relevant legislation). However, the requirement for public participation is not legally mandated in a majority (five out of nine) of the Canadian provinces.[24] In these five provinces, the opportunity for public participation is at best based in policy guidelines or simply left to the discretion of the decision-maker. The requirement for public participation in the Territories is found in land use planning agreements between the Federal and Territorial Governments. Section 4.4 of the "Basis of Agreement on Northern Land Use Planning" (July 28, 1983) requires public participation in Northwest Territories land use planning. In the Yukon, section 4.7 of the "Agreement on Land Use Planning in the Yukon Between The Government of

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[24] These include Saskatchewan, Manitoba, New Brunswick, Nova Scotia and Newfoundland.

Table Two Jurisdictional Summary

	Legislation	P.P. at Policy Level	P.P. at Operational Level	Access to Information	Adequate Resources	Written Responses	Conflict Resolution	Appeal Mechanism	Advisory Bodies
Alberta	(X)	X			(X)				X
Saskatchewan								X	
Manitoba				X			(X)		
Ontario	X	X	X	X		X			
Quebec	X		X	X					
New Brunswick				X					
Nova Scotia				X					
P.E.I.	X	X	X					X	
Newfoundland				X					
N.W.T.	X		X		(X)				
Yukon	X		X		(X)				X
USFS	X	X	X	X		X		X	
BLM	X		X	X		X		X	
Washington				X				X	(X)
Oregon	X	X	X	X					X
Alaska	X		X			X			(X)
New Zealand	X	X	X	X				X	X
N.S.W. Australia	X		X	X				X	

(X) = Component occurs inconsistently

Table Three Legislation Mandating Public Participation

Jurisdiction	Legislation
Alaska	Alaska Statue 38.04.65 and AAC 555.020(b)
Alberta*	Land Surface and Conservation Act. R.S.A. 1980, c. L-3
Bureau of Land Management	Forest Land Planning and Management Act of 1976, 16 U.S.C. 1600 et. seq. National Environmental Policy Act of 1970, Pub. L. No.91-190;83-Stat. 852.
New South Wales	The Environmental Planning and Assessment Act. 1979, N.S.W. Aust.
New Zealand	The Environment Act. 1986, S.N.Z. No.127
Northwest Territories	The Basis of Agreement on Northern Land Use Planning (1983)
Ontario	Environmental Assessment Act. R.S.O. 1980, c.140
Oregon	Land Use Act. 1987, O.R.S. C.183 &197 Forest Practices Act. 1982, O.R.S. c.526
Prince Edward Island	Planning Act. R.S.P.E.I. 1988, c.P-8
Quebec	Land Use Planning and Development Act. S.Q. 1979, c.51
United States Forest Service	National Forest Management Act of 1976 Pub. L. No.94-588; 16 U.S.C. 1600 et. seq. National Environmental Policy Act of 1970, Pub. L. No.91-190;83-Stat. 852.
Yukon	Agreement on Land Use Planning in the Yukon Between The Government of Canada and The Government of The Yukon (1987)

* For Energy Projects Only

Canada and The Government of The Yukon" (October 22, 1987) requires that the public must have the opportunity to participate in all planning stages.

The necessity to conduct environmental assessments provides the legal requirement for public participation in a number of jurisdictions. In Ontario, the legal mandate is rooted in the Environmental Assessment Act (1980) which requires full public participation in all environmental assessments. Public participation is not legally mandated for Comprehensive Land Use Planning since environmental assessments are not required. However, environmental assessments are required during the Timber Management Planning Process. Section 3.0 of the "Timber Management Planning Manual for Crown Lands in Ontario" describes the public participation process (Ontario MNR 1986). In the United States, the National Environmental Policy Act of 1970 (NEPA) requires that public participation opportunities exist during the completion of environmental impact statements (EIS's). EIS's are required for most planning and management activities of the BLM and USFS. Part 1506.6 of the "Regulations for Implementing The Procedural Provisions Of The National Environmental Policy Act" (U.S. Executive Office of the President 1986) sets out the public participation requirements for EIS's. In addition, the "planning acts" of both the BLM and USFS specify that public participation must occur during the planning process. Section 1610.2 of the associated BLM federal regulations (U.S. Department of Interior 1984) specifies the requirements for public participation under the Forest Land Planning and Management Act of 1976. For the USFS, the requirement is specified in section 219.6 in the "National Forest System Land and Resource Planning Regulations" (36 CFR) associated with the National Forest Management Act of 1976 (U.S. Department of Agriculture 1982).

Comprehensive Public Participation Opportunities

For effective public participation, involvement must occur as early as possible and during all stages of the planning process. Twelve of the eighteen jurisdictions reviewed required public participation throughout all stages of the operational planning phase (refer to Table Two). Some jurisdictions such as Washington and Alaska utilized public advisory bodies to ensure public participation occurred throughout the planning process (refer to section below on advisory bodies).

The number of opportunities for public participation at the policy (normative or strategic) level of planning is less than at the operational level. Usually participation at this more abstract level of planning takes place through an advisory body. In Alberta, the Alberta Integrated Planning Advisory Committee (AIPAC) acts as standing public advisory body for the Department of Forestry, Lands and Wildlife, in matters relating to the integrated resource planning (IRP) and management of the Province's public lands and resources. AIPAC's major functions include: reviewing the IRP process, policies and plans; disseminating information to the member groups; advising the Minister of Forestry, Lands and Wildlife on IRP issues; and acting as an ongoing forum for member groups to presents ideas and concerns. The public members of AIPAC are appointed by the Minister from nominations within each of the ten member groups. A Member of the Legislative Assembly who acts as chairperson and the Assistant Deputy Minister, Public Lands Division, Forestry, Lands and Wildlife acting as Executive Secretary brings the total membership of AIPAC to twelve members. The member groups represented include one wilderness association, three user (recreation) groups and six industry associations (Alberta 1984).

In Prince Edward Island, representatives of the 'private sector" (non-government) are appointed to the Land Use Commission by the Lt. Governor in Council. One of the

Commission's responsibilities is to provide advice and make recommendations to the government on land use issues. The commission endeavors to have all interests represented, such as agriculture, fishing, and municipal government from all regions of Prince Edward Island. The province also requires that public hearings be held on proposed policies, regulations and guidelines or for any proposed amendments (Blakney 1990). In Ontario, the general public participates in the development of guidelines and long-term goals during strategic land use planning. A strategic plan has been completed for each of the three planning regions of the province. Public participation plays an integral role in the development of the plan, with major revisions made based on public comments on the draft plan (Ontario MNR 1986).

Organizations made up of public representatives are also used in the United States to allow public input into policy development. The Oregon Forestry Board's participation in forest management extends beyond the advisory role. The Board is made up of seven public appointees, of which no more than three can derive significant income from the forest industry. In addition, at least one of these appointees must live in each of the State's four regions. The Board's responsibilities include giving policy direction, setting regulations and allocating land (Lorensen 1990). For the USFS, "public" participation in the development of national policy is limited to participation by Congress. An annual review of the activities and the policy direction of the USFS is required in the National Forest Management Act of 1976.

Public expectations for participation in policy development in New Zealand were intensified during the 1980's, when the structure of natural resources management was transformed by the government. Public discussion of this massive restructuring of the administrative and legal framework was encouraged, through the distribution of policy discussion papers and requests for public submissions. Standing advisory bodies called QUANGOS (Quasi-Autonomous Non-government Organizations) were created to act as an independent source of advice to the government, along with other responsibilities noted below (Grzybowski 1989a and Penny 1990).

Access to Information

The right to access information held by government agencies is legally mandated in a majority of the jurisdictions reviewed (12 of 18). In Canada, only Alberta, Saskatchewan, Prince Edward Island and the two territories do not have access to information legislation. The only non-Canadian jurisdiction reviewed in this study that did not have a similar piece of legislation was Alaska (Table Two).

The freedom of information legislation in most jurisdictions includes details on the right to access the information, restrictions that may apply to that access, and typically an appeal mechanism. A representative example of this arrangement is in Manitoba, where the right to access information is rooted in The Freedom of Information Act (S.M. 1985, c.6). Section three of this Act states that ". . . every person has, upon application, a right of access to any record in the custody or under the control of a department, including any record which discloses information about the applicant." There are some restrictions applied to this access, as detailed in the Act. However, section 15(1) specifies that it is the duty of the Provincial Ombudsman to review any refusal for application to access information based on those restrictions (1985). In Ontario, the right to access information is guaranteed under the Freedom of Information and Protection of Individual Privacy Act (S.O. 1987, c.25). In Quebec, the Act Respecting Access to Documents Held by Public Bodies and the Protection of Personal Information (R.S.Q. 1982, c.30) outlines the rights, restrictions and the avenue of appeal that exists under this legislation. Sections 135 to 154 outline the two-step appeal process, which involves first appealing a refusal for access to the Commission of Access to Information, and then to three judges of the Provincial court. In New Brunswick, the Right to Information act

(S.N.B. 1978, c.R-10.3) allows an appeal to the Provincial ombudsman or to the supreme court. The Freedom of Information Act (S.N.S. 1977, c.10) in Nova Scotia allows an appeal to the Minister, and then to the House of Assembly. Newfoundland's Freedom of Information act (R.S.N. 1981, c.5) also stipulates a two level appeal, first to the Provincial ombudsman, and then to the supreme court. Federally, Canada also has had an Access to Information Act (R.R.S. 1983) in place since July 1, 1983. However, since the authority over natural resources rests with the provinces, the usefulness of this legislation in natural resource issues is limited (Vance 1990).

In contrast to the Canadian structure, management of natural resources in the United States is mainly a federal responsibility. The Freedom of Information Act of 1966 (Pub. L. No.89-487) outlines the rules and limitations for that access. Generally, a citizen has the right of access to any documented information that any federal agency possesses. In addition, Section 1500.1(b) of the regulations associated with NEPA specifies that "NEPA procedures must insure the environmental information is available to public officials and citizens before decisions are made and before actions taken" (U.S. 1986). Oregon and Washington also have similar state legislation (Vance 1990).

Both New Zealand and the Australian province of New South Wales have enacted freedom of information acts. The Official Information Act (S.N.Z. 1982, No.156) of New Zealand outlines rights and restrictions to information, along with a two level system of appeal utilizing the ombudsman and the supreme court. New South Wales's legislation, the Freedom of Information (N.S.W. 1989, no.5) was the most recent legislation enacted in the jurisdictions reviewed.

Adequate Resources for Participation

Financial assistance for public participants in planning processes is limited and occurs in only three jurisdictions: Alberta, the Yukon, and the Northwest Territories. Even in these jurisdictions, the assistance is usually restricted to certain members of the public or during specific review processes. Intervenor funding is available in the Northwest Territories on a discretionary basis. To assist the Yukon native people to participate effectively in the planning process, section 4.6(c) of the Yukon Land Use Planning Agreement directs each Regional Planning Commission to fund training and orientation for the native community (1987). In Alberta, public participants of the Energy Resources Conservation Board energy project review process may receive intervenor funding during the public hearings.

Written Responses

Feedback to the public participants concerning the use of their input and the reasons for the decision is provided in only four jurisdictions: Ontario, USFS, BLM, and Alaska. In Ontario, section 7 of the Ministry of Natural Resources Public Involvement Policy specifies that the public must be given feedback concerning how public input was used and the rationale for decisions made (Ontario MNR 1988). Sections 219.8(d)1 and 219.10(c)1 require the USFS to provide written responses (U.S. Department of Agriculture 1982), and the BLM Planning Manual specifies the same requirement for the BLM (U.S. Department of Interior 1984). In addition to their own planning process, NEPA requires the BLM and USFS to complete a public record of decision for any EIS (United States 1978, s. 1500.1(b)). Alaska requires written responses as part of the regular planning process. Feedback usually consists of responding to the public's concerns after they have been organized into categories and making that report available to the public.

Conflict Resolution

Established conflict resolution mechanisms were not evident in any of the jurisdictions reviewed. The only arrangement for ad hoc conflict resolution came from Manitoba, where the Environment Act (S.M. 1987, c.26) allows the Minister responsible for this Act to appoint an environmental mediator to assist in resolving environmental conflicts (Warener 1990). Section 3(3) of the Act states that:

> The minister may, where the minister deems it advisable, and where the conflicting parties concur, appoint an environmental mediator acceptable to the parties to mediate between persons involved in an environmental conflict, and the mediator so appointed shall, within six weeks after completion of the mediation, report to the minister the results of the mediation
>
> (S.M. 1987, c.26)

The Timber/Fish/Wildlife Agreement in the state of Washington was devised to resolve a century-old conflict. The system that has been established for managing the timber, fish and wildlife resources is dependent upon ongoing consultations and negotiations between all parties. This system, while arguably a model for negotiated conflict resolution, was established by nongovernmental interests and not initiated by the government. The State government joined the process only after it was initiated, and only then as an equal partner.

Right to Appeal

The right to appeal a decision of the resource or land use planning process is available in seven of the eighteen jurisdictions, of which only two are Canadian provinces (Table Two). In Saskatchewan, an independent appeal board is appointed by the Lt. Governor in Council under the proviso of The Planning and Development Act (R.S.S. 1983, c.P13-1). The Board hears appeals based strictly on procedural disputes regarding the interpretation of the Act. The only other Canadian example of an appeal board is in Prince Edward Island, where the Planning

Act (R.S.P.E.I. 1988, c.P-8) enables the Land Use Commission (noted above) to act as a quasi-judicial appeal board. Any person dissatisfied with the decision made under the Planning Act can appeal that decision to the Land Use Commission (Blakney 1990).

In the United States, both the USFS and the BLM allow appeals of their plans. The BLM appeal process consists of a two level process, with the first level of appeal as an administrative level protest to the appropriate BLM State Director. Section 1610.5-2 of the BLM regulations restricts standing or access to this protest, requiring that the individual participated in the planning process and be able to display a personal interest that will be adversely affected. In addition, protests are restricted to issues raised by the individual during the planning process (U.S Department of Interior 1984). The next appeal is made to a quasi-judicial appeal body in the Department of the Interior, where the BLM resides (Stone 1990).

The USFS also has a multi-step appeal process, although both levels are administrative. Section 211(b) of the National Forest System Land and Resource Management Planning Regulations authorizes the appeal process (United States, Department of Agriculture 1982) The allowable appeals include that the Regional Guide can be appealed to the Chief Forester, and Forest Plans to the Regional Forester. As a final check, the Secretary of Agriculture can review the Chief Forester's ruling (Vance 1990). Washington State also has a two-step administrative appeal process. The first level of appeal is directed to the Supervisor of the State Department of Natural Resources, and then the appeal is heard by the Board of Natural Resources. The importance of bestowing sufficient power to the appeal body is displayed by the Land Use Board of Appeals (LUBA) in Oregon. Although LUBA only involves itself with municipal matters, this appeal body exhibits an important characteristic: LUBA has been given powers similar to Local court, thus allowing LUBA to call witnesses and to make decisions that have the force of law (Department of Land Conservation and Development 1986). This characteristic of an appeal body ensures efficiency and credibility, and allows the appeal body to act as an effective check to discretionary decision-making.

The right to appeal in New Zealand is an integral part of the planning process, and acts as an important check to discretionary power (Grzybowski 1989a and Penny 1990). Any citizen has standing to appeal a plan or decision. The appeal goes through two stages. The first stage involves an informal hearing heard by a committee of the Territorial Council.[25] If the dispute is not satisfactorily resolved by the Territorial Council Committee, the appeal then goes to a national environmental court called the Planning Tribunal. At this level the appeal becomes quasi-judicial in nature and the right to legal representation and to cross-examine witnesses is available (Penny 1990). Another environmental court, the Land and Environment Court, adjudicates appeals in New South Wales, Australia. Standing is provided to any interested citizen or group that can demonstrate that there may have been a procedural error in reaching to the decision, or that the best option was not represented or chosen. The court has the power to overrule or modify decisions and demand that an environmental assessment be completed (Grzybowski 1989a).

Public Advisory Bodies

A number of jurisdictions utilize advisory bodies to ensure that general public participation occurs and that members of the public traditionally ignored can participate, or to act as a permanent source of public advice. In the Yukon, the organization that represents native people, the Council of Yukon Indians, participates as an equal member of an advisory committee with Federal and Territorial government officials. A Council of Yukon Indians representative is a member of the Policy Advisory Committee, which advises the Federal and Territorial Ministers responsible for planning in the Yukon (Yukon 1987, s.4.3). In Alaska, a public advisory body may be established to help solicit additional participation if it is perceived that the planning issue has a high public profile or is overly technical in nature (Welbourn 1990). In Washington State, a public advisory group can be established, as it was during the planning process for the Tiger Mountain State Forest. The public advisory body acted as an advisor to the forest planning process right through to implementation. Initially the Forest Advisory Committee, made up of citizens, recommended guidelines and identified issues for the Departmental of Natural Resources planning team. After the plan was implemented, the Forest Advisory Committee nominated a smaller Citizen Advisory Committee to act as a standing public advisory body to maintain public participation (Washington DNR 1986).

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[25] New Zealand is divided jurisdictionally into 13 regions, and then further subdivided into 79 territories.

In New Zealand, in addition to general public participation through the planning process, a number of permanent Quasi-autonomous Non-government Organizations (QUANGOS) have been established. QUANGOS supply the government with an alternative source of information or advice. QUANGOS act as monitors for public participation and resource management practices and hold limited veto powers over certain aspects of a plan. Other than their advisory role, each QUANGO is assigned an area of study and fulfills a research mandate. Although the operating budgets for QUANGOS come from both government and private sources, they operate independent of the government. Members are appointed by the government from different sectors of resource use and from a list of citizens nominated by the public (Grzybowski 1989a and Penny 1990).

5.2 Conclusion

The review of these jurisdictions has resulted in a list of components that have been identified as important for an effective public participation process (Table Two). Lessons distilled from this comparative exercise add practical experience to the theoretical lessons discovered during the literature review, and give a well-grounded foundation to the argument of the importance of these components in an effective public participation process. Not surprisingly, the majority of the components highlighted by the jurisdictional review were already identified in the literature. The legal mandate for public participation is a very important component. In addition to ensuring the right to participate, legislation can specify the adoption of the other components and define the roles and responsibilities for participants and decision-makers alike.

Chapter Six

Public Participation in the Ministry of Forests

This chapter describes the MoF planning process and the public participation process that accompanies it. This description includes a review of the legislative and policy framework, the regular planning and participation processes, special opportunities and new directions for public participation.

6.1 History

A major outcome of the Pearse Royal Commission on the state of the forest industry and forest management in 1976 was the recognition of the need to adopt integrated planning and management for the Province's forest resources. The government responded by enacting the new Forest Act and the Ministry of Forests Act in 1978. Within a number of years, the majority of the Province's land base was designated as Provincial Forests under the jurisdiction of the MoF.[26] Demands for increased public participation in the management of Provincial Forests during the 1970's were recognized by those involved in forestry, including the MoF. The Forest Land Use Liaison Committee, an independent group which discusses provincial forestry issues and includes members from both industry and environmental groups, released a consensus statement that included the principle that "British Columbians have a right to a role in the development of forest land use decisions".[27]

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[26] 85% of the province, or 80.58 million hectares are designated as provincial forests (BC MoCL 1989).

[27] Forest Land Use Liaison Committee (1978), quoted in Niezen (1987), 3.

In 1980, the Deputy Minister of Forests also noted the emerging importance of public participation:

> There are...innumerable questions of resource management detail in which the participation at the local level between resource professionals and the public is necessary. Citizens of the Province need to know what the implications are of choosing among various resource options and we, as forest managers, need to know what an informed public wants in order to present technical options that are workable. The Ministry of Forests is actively promoting a Public Involvement Program to address these needs.[28]

That Public Involvement Program began in 1980, when the Ministry hired its first Public Involvement Coordinator.[29] Basic objectives of the program were: to provide forest resource managers with a choice of public participation techniques; to promote opportunities for the public to become educated about and involved in the planning process; to promote better communication between resource managers and the public; and to evaluate and improve the public participation process (BC MoF 1981). A draft of the public involvement policy followed in 1981. The Public Involvement Handbook (BC MoF 1981) was published the following year to provide guidance for the Ministry's staff in conducting public participation programs. In January of 1983, the MoF adopted its official public involvement policy, which is still in place. The latest stage for the MoF in self-instruction on public participation was the publication of Chapter Two of the Resource Planning Manual in 1984. This manual identifies the basis of public involvement activities in the MoF. In response to demands for increased public participation opportunities, the MoF is in the process of developing a new policy on public involvement. However, as a draft policy it is not available for open public review.

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[28] Mike Apsey (1980). Quoted in Niezen (1987), p.1.

[29] The term involvement is used by the MoF rather than participation. Therefore, public participation and public involvement will be used interchangeably in this chapter.

6.2 Statutory and Policy Framework of the Ministry of Forests

6.2.1 Legislation

Legislation that guides the MoF includes the Forest Act, 1979, the Ministry of Forests Act, 1979, and the Range Act, 1979. Public participation is not specifically mandated by these acts. The only precise requirement for public participation noted is in section 27(2) of the Forest Act, which states "The Minister shall not enter into a tree farm licence under this section unless he advertises as provided in subsection (1) and a public hearing is held on the applications" (1979). The only reference in the legislation to a general requirement of public participation in the planning process of the MoF is found in section 4 (c) of the Ministry of Forests Act which states:

> The purposes and functions of the forest Service are, under the direction of the minister, to...(c) plan the use of the forest and range resources of the Crown, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the Crown and with the private sector (BC MoF 1978b).

The "private sector" is interpreted by the Ministry to include the public (Currie 1990).

6.2.2 Policy Structure

In the absence of any direction from the legislation, the guidance for public participation is based strictly on policy guidelines. Policies fill in details and assign responsibilities for the public participation process (Vance 1990). The MoF policies which affect public participation include the Public Involvement Policy, the Access to Information Policy and local policies established within specific districts or regions.

Public Involvement Policy

The public involvement policy identifies public participation as necessary to improve the management of forests by including a societal perspective in the planning process. The public involvement process is intended to close the democratic loop between the government and the public (BC MoF 1981). The public involvement policy incorporates the following basic guidelines, as noted in Chapter Two of the Resource Planning Manual:

> - all Forest Service [MoF] employees, as part of their regular duties have a responsibility to communicate with the public;
> - Forest Service staff are responsible for taking the initiative to keep the public informed of Forest Service plans and programs;
> - the public involvement program is intended to be responsive to local need;
> - a broad range of methods is available for involving the public;
> - although the public often has a major role in resource decision-making and implementation, the responsibility for decisions made and for ensuring implementation occurs, lies with the Forest Service;
> - public review of Management and Working Plans for Tree Farm Licences is required;
> - all questions and recommendations from the public will be responded to. Reasons for nonacceptance of recommendations must be provided;
> - logistical support for Forest Service sanctioned involvement will be provided by the Forest Service; and
> - a summary of public involvement activities will be published by the Forest Service in the form of an annual report.
>
> (BC MoF 1984, 2:12)

The policy guideline that requires preparation of an annual summary report has not been fulfilled for a number of years. The report was prepared during the first few years after the public involvement policy was released. However, the MoF decided that the annual report was of little value and it was discontinued (Niezen 1990).

Access to Information Policy

The MoF's Access to Information Policy was released on December 8, 1989. The policy states that "The [MoF] recognizes the importance of providing the public with information about British Columbia's forest and range resources and the Ministry's policies and programs" (BC MoF 1989, 1). The policy statement notes that it is the policy of the MoF "to release information which is necessary for participants of public involvement programs or reviews sponsored by the [MoF] or other provincial government agencies (BC MoF 1989, 1). Under this policy, information is classified as either "open" or "confidential". However, these definitions of confidential and open information are not very helpful in clarifying what information is accessible or in releasing additional information to the public, as open information is merely defined as "all information already available to the public (for example, annual reports) and Ministry information not identified as CONFIDENTIAL" (BC MoF 1989, 1). Confidential information is defined as "information that is NOT available to the public or not available for general circulation within or outside the Ministry" (BC MoF 1989, 2). The definitions of open and confidential information only succeed in stating the obvious; the public can only access open information and cannot access non-confidential information. The policy does include examples of open and confidential information in Annex A of the policy.

Local Policies

Within the constraints of provincial legislation and policy, the MoF authorizes some discretionary policy development at the district and regional levels (Vance 1990). This local policy development allows the District and Regional Managers to adapt provincial policies, guidelines or planning processes to site specific needs or in reaction to local public concerns. An example of a local adaptation is described in section 6.5.2 of this report.

6.3 Ministry of Forests Planning Process and Public Participation

The province is divided into 6 Forest Regions and further into 43 Forest Districts, with each Region and District headed by a manager. Districts correspond roughly to many of the 35 Timber Supply Areas (TSA's). There are also 32 Tree Farm Licenses (TFL's), along with various other types of tenure. Planning occurs at 5 different levels (figure two), although the TSA and TFL planning processes at the resource management level is the predominant level. Each level of the planning process is described below, detailing the steps in the process and the public participation opportunities offered.[30]

6.3.1 Provincial Planning

Normative and strategic planning, which guides planning at the lower levels, occurs at the provincial level. The Ministry policies, programs and procedures which are based on the government's priorities, resource use opportunities and the government's perception of societal needs and preferences are set out at the provincial planning level (Niezen 1990). Planning products at this level are required by section 10 of the Ministry of Forests Act (1979), and include the MoF Five Year Forest and Range Program and the Ten Year Forest and Range Resource Analysis. The Resource Analysis presents an accounting of provincial resources, including an inventory of forest and range resources, a description of the extent of forestry activities, an analysis of trends and forecasts, and a description of the programs undertaken. The Analysis is focused at the provincial level and not on the site specific issues. It is concerned with provincial issues of supply and demand for timber, and general inventory of all resources (Niezen 1990).

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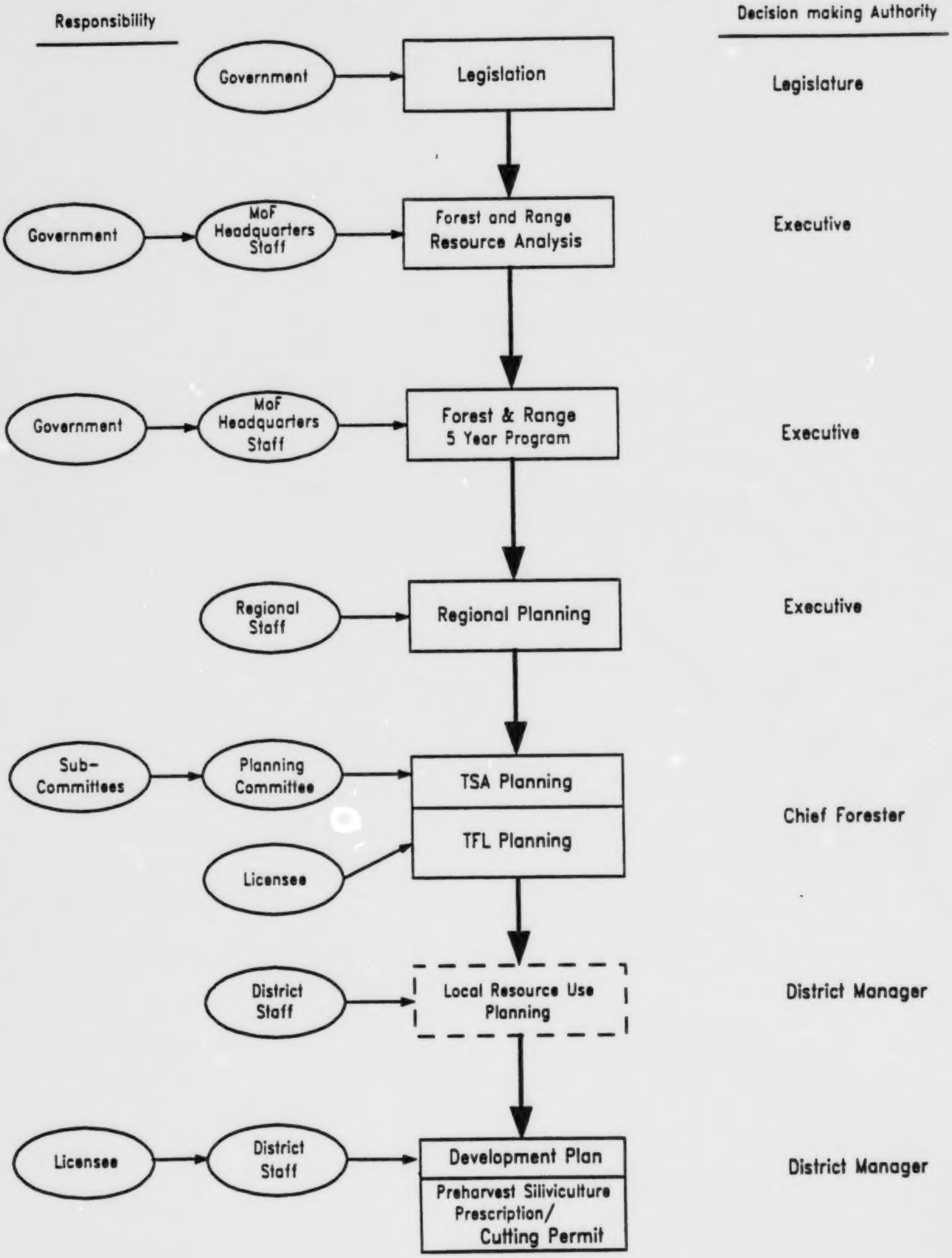
[30] General references for this description of the planning process include BC MoF (1984); BC (1979a,b,&c); Niezen (1990); and Vance (1990).

Figure Two MoF Planning Process


Responsibility
Decision making Authority
Government
Legislation
Legislature
Government
MoF Headquarters Staff
Forest and Range Resource Analysis
Executive
Government
MoF Headquarters Staff
Forest & Range 5 Year Program
Executive
Regional Staff
Regional Planning
Executive
Sub-Committees
Planning Committee
TSA Planning
TFL Planning
Licensee
Chief Forester
District Staff
Local Resource Use Planning
District Manager
Licensee
District Staff
Development Plan
Preharvest Siliviculture Prescription/ Cutting Permit
District Manager

The Five Year Forest and Range Program acts as the development stage for provincial policy in the MoF's planning process. The Program lays out broad provincial policies, establishes regional goals and sets targets based on the supply and demand evaluation in the Resource Analysis. Various alternatives to reach these objectives are described, and land is allocated for different uses. The MoF headquarters staff in Victoria is responsible for developing the policies and the Program, which incorporate the Forest Minister's own policies and goals. It is at this level where the Chief Forester determines the annual allowable cut (AAC) for each TSA/TFL, based on numerous social, economic, environmental and biological considerations (BC 1979a, sec.7). These TFL and TSA AAC's are aggregated to produce the Provincial AAC. MoF staff in Victoria provide policy direction for regional staff and monitor regional planning activities. A report is produced each year on the progress of meeting the targets and goals set in the Program.

There is no on-going, formalized public participation at the provincial level of planning. Strategic and normative planning typically occurs only during the development of the Five Year Forest and Range Program. Other policy development occurs on an adhoc or reactive basis, as issues arise. Here public participation opportunities are quite formal and include such as opportunities as royal commissions and special working groups.

6.3.2 Regional Planning

The next level of planning is at the regional level, where regional priorities are set. Within the context of the provincial policies set out in the five-year Program and under the direction of the Regional Manager, the regional staff of each of the six provincial forest regions set priorities and tentative production targets based on regional goals established in the Program. Regional planning staff are also responsible for coordinating planning activities with industry, other agencies and Ministries. It is important to note that at this level of planning, no actual regional plans are prepared and priorities and production targets are simply established. The only public participation that occurs at the regional level is ad hoc and informal.

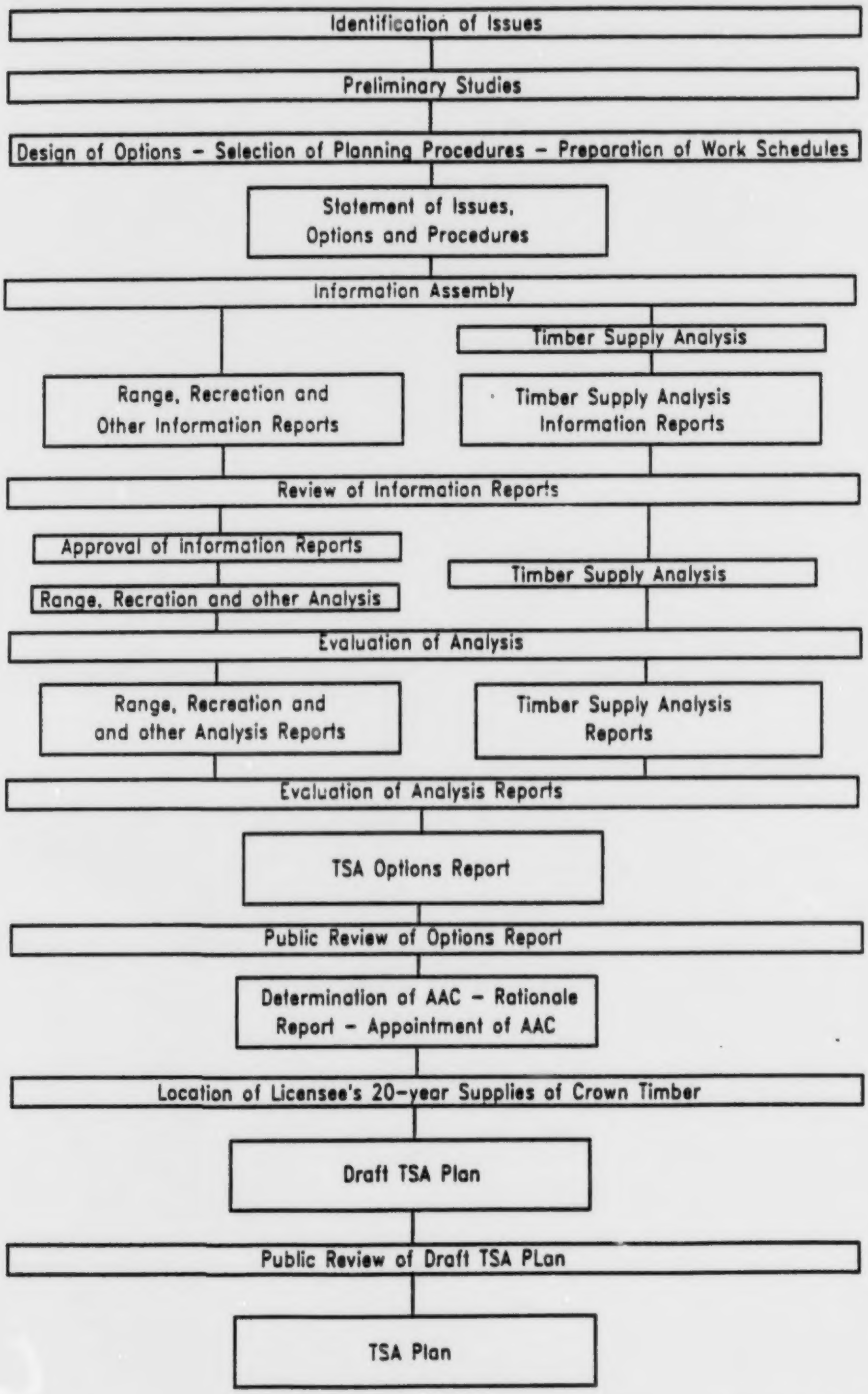
6.3.3 Resource Management Level Planning

The most comprehensive planning occurs at the resource management level through TSA and TFL planning. A majority of the planning effort occurs at this level, including the analysis of various resource use options. TSA and TFL areas are the basic units for MoF planning, and the TSA/TFL plans act as guides for integrated resource use in provincial forests. General resource management strategies are established during the development of each plan and include direction for such matters as integrating wildlife concerns with timber harvesting. In addition, these plans are used along with other considerations by the Chief Forester to set the AAC for each TSA or TFL.

The general planning steps for the development of a TSA Resource Management Plan or the TFL Management and Working Plan are similar, with only minor variations (please refer to Figure Three for the TSA planning process and Figure Four for the TFL planning Process). The seven general planning steps identified in the Resource Planning Manual (1984) include:

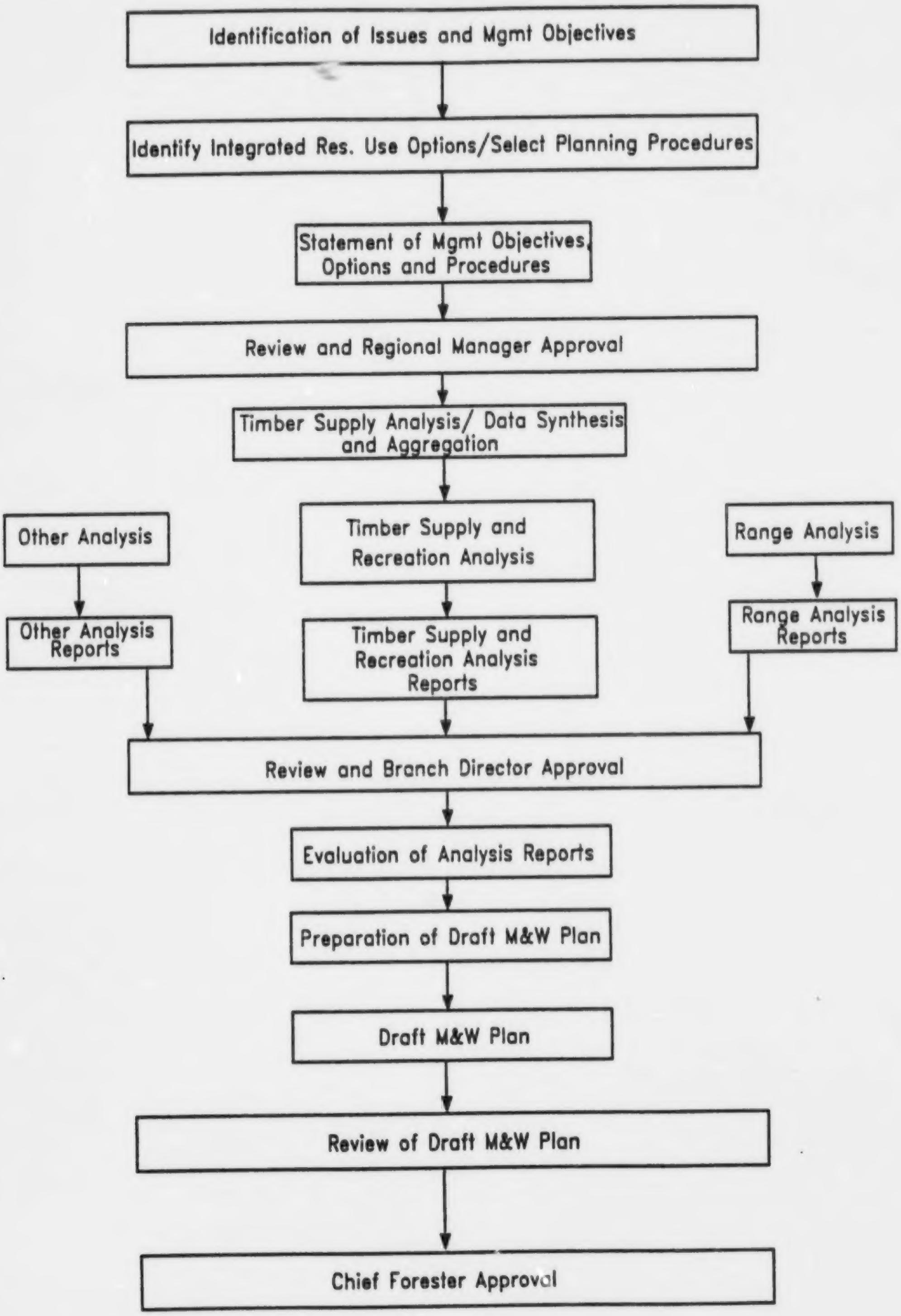
1. Preliminary Organization - Includes identification of issues, objectives and options.
2. Information Assembly.
3. Development and Analysis of Options - Includes completion of Timber Supply Analysis, Recreation Analysis and Range analyses.
4. Evaluation of Options.
5. Selection of Option.
6. Implementation.
7. Monitoring.

Figure Three Timber Supply Area Planning Process


Identification of Issues
Preliminary Studies
Design of Options – Selection of Planning Procedures – Preparation of Work Schedules
Statement of Issues, Options and Procedures
Information Assembly
Timber Supply Analysis
Range, Recreation and Other Information Reports
Timber Supply Analysis Information Reports
Review of Information Reports
Approval of information Reports
Timber Supply Analysis
Range, Recration and other Analysis
Evaluation of Analysis
Range, Recreation and and other Analysis Reports
Timber Supply Analysis Reports
Evaluation of Analysis Reports
TSA Options Report
Public Review of Options Report
Determination of AAC – Rationale Report – Appointment of AAC
Location of Licensee's 20-year Supplies of Crown Timber
Draft TSA Plan
Public Review of Draft TSA PLan
TSA Plan

Source: Modified from BC MoF 1984. Chap. 3:7.

Figure Four Tree Farm Licence Planning Process


Identification of Issues and Mgmt Objectives
Identify Integrated Res. Use Options/Select Planning Procedures
Statement of Mgmt Objectives, Options and Procedures
Review and Regional Manager Approval
Timber Supply Analysis/ Data Synthesis and Aggregation
Other Analysis
Timber Supply and Recreation Analysis
Range Analysis
Other Analysis Reports
Timber Supply and Recreation Analysis Reports
Range Analysis Reports
Review and Branch Director Approval
Evaluation of Analysis Reports
Preparation of Draft M&W Plan
Draft M&W Plan
Review of Draft M&W Plan
Chief Forester Approval

Source: Modified from BC MoF 1984. Chap. 4: 13

A detailed description of all aspects of the planning steps for the development of TSA and TFL plans is not necessary for this report. A number of opportunities for potential public participation exist through public initiative, such as making submissions on timber supply or recreation analyses or demanding to review documents. This study concentrates on the steps in the TSA and TFL planning processes where public participation opportunities are established by the MoF.[31]

TSA Resource Management plans are prepared for a five year term and cover a twenty-year planning horizon. Timber supply forecasts under a variety of management scenarios are analyzed, along with other potential uses or values for the area. In a recent development, TSA Steering Committees (which provided information and input to the Mof planning staff) have been replaced by TSA Planning Committees, which are now the central structure of the TSA planning process. A Planning Committee, chaired by an MoF planner, is established for each TSA and is responsible for directing and managing TSA planning. Membership is expanded from the steering committee to include a wider range of provincial government staff and regional government representatives. Industry interests and associations are now included in sub-committees that support the planning committee, although steering committees may still be formed when necessary. The same groups are represented on all committees. Even with the expanded membership however, the general public is not included on any of the planning committees (Niezen 1990).

Public input is required by the public involvement policy to identify issues and management objectives, and the MoF is required to notify the public of this opportunity. The public is also allowed an opportunity to review the draft terms of reference and submit comments. Public input is not required at any other stage of step 1, nor in step 2 (information assembly), or step 3 (analysis of options), although completed analysis reports are public documents and assistance in identifying issues is often solicited. During the evaluation of options (step 4), the public is allowed to review the Options Report and the draft TSA Resource Management Plan. For the draft plan, the MoF must notify the public and allow for written submissions. The Chief Forester may approve a TSA Resource Management Plan based on the recommendation of the Integrated Resources Branch and the Region and District. No public participation is required for their approval, although any public comments gathered informally are referred to the Chief Forester for consideration. Implementation of the TSA Resource Management Plan includes using the plan for management and in the development of subunit plans and development plans (see below), where the public may participate.

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[31] The reader is directed to BC MoF 1984 (Chapter 3 & 4) and Vance (1990) for further details on the planning process. Vance in particular identifies all potential areas where the public can initiate participation.

The public does not traditionally participate in monitoring at the TSA planning level. It instead occurs more frequently at the Local Resource Plan level where the goals and objectives of the plan are more quantifiable and measurable. The only regular monitoring at the Resource Management level is done for timber production by MoF staff. The public can initiate its own monitoring if they so desire (Niezen 1990).

The planning process for a TFL Management and Working Plan is completed by the licensee every 5 years, following guidelines established by MoF based on section 28 of the Forest Act (1979). No steering committee is required, and public participation opportunities are limited. Public participation is required only at two steps of the planning process, although increased public participation opportunities may occur at the discretion of the TFL planning staff. At the beginning of the process (step 1), the licensee must advertise that the Management and Working Plan is being prepared and that the public may make submissions. The next opportunity for public participation occurs in step 4 of the planning process where the licensee must notify the public about an open house to view the draft Management and Working Plan.

Like the TSA process, the TFL planning process allows 30 days for written submissions. Monitoring opportunities in TFL planning are limited for the MoF staff and public alike.

6.3.4 Local Resource Use Planning

Local Resource Use Planning covers sections of TSAs where more intensive analysis and planning is required due to the nature of the resource and its use. In fact, the level of potential conflict or sensitivity of the area dictates the extent to which planning is necessary. The use of this optional level of planning and the level at which it occurs corresponds directly to the potential for conflict. It is at this level of the planning process where multiple-use conflicts are often resolved. Geographically, the planning-unit traditionally involves a watershed, and planning is typically concerned with establishing more site specific management guidelines. There are over 200 Local Resource Plans in place or presently being developed (Niezen 1990).

The public participation process ranges from no participation, to consultation between government agencies, up to involvement on task forces. Task forces are the highest level of public participation, even though they remain only an advisory body. Participants of task forces include the government, industry, public interest groups, native representatives and general citizens. The more complex the issue, the more comprehensive the planning process. Joint planning teams, the next step after task forces, cannot be considered an opportunity for public participation since they rarely include public members (BC MoF 1984). Joint-planning teams usually consist of members of various provincial and federal government agencies. The public may be included as advisors, but do not have decision-making authority.

Local Resource Use planing teams have a variety of names. Historically, local planning processes have included the Meares Island Planning Team, the Chilliwack Supply Block Planning Task Force and the Tahsish Task Force. Sometimes a non-timber resource licence holder may have decision-making authority on these joint planning teams. Public involvement at this stage is generally in the form of consultation. However, like the level of planning effort, the level of public participation increases with the anticipated level of conflict. District staff are typically responsible for this level in the planning process.

Public participation may occur at the Local Resource Use planning level. The MoF Resource Planning Manual (1984) notes that "...field trips and some ongoing mechanism for public monitoring is often necessary" (sec. 2.226). Quantifiable details exist at the local resource plan level which make monitoring possible. The establishment of monitoring groups that include public representatives is an option of the Forest District, and usually depends on the public profile of the plan. There are only a few official follow-up committees in place, with an additional one being planned for the Carmanah region and a few adhoc monitoring groups. The most comprehensive follow-up committee is associated with the Tsitika Valley Local Resource Plan, within the Strathcona TSA. This committee has been in place since the plan was implemented in 1978. The membership includes representatives from two public interest groups, various government agencies, the three licensees in the TSA, labour unions and the whale watching tour operators. The MoF is in the process of expanding the membership. The group's mandate is to ensure implementation of the plan, to coordinate special studies and to review the Five Year Development Plans and any amendments to the plan. There is no voting on the follow-up committee, which instead works on consensus building when presenting recommendations to the district staff.[32]

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[32] Information on the Tsitika Valley Local Resource Plan follow-up committee was supplied by Huestis (1990).

6.3.5 Operational Planning

The last stage in the forest planning process is at the operational level. This involves the specifics of the timber harvesting where the details of how, what and where forest and range operations are to proceed are laid out. There are 2 types of plans drafted here: Five Year Development Plans, which broadly outline proposed cut-blocks; and Pre-harvest Silviculture Prescriptions and Cutting Permits, which outline specific cut-block boundaries and list conditions or harvest restrictions to protect non-timber resources.

The licensee drafts the development plans, which may be approved by the MoF District Manager. The licensee is required to display the plan and receive comments from other government agencies and the public. Comments of both government agencies and the public must be considered to the satisfaction of the District Manager.

Cutting permits are drawn up by the MoF staff and may take into consideration comments received on the development plan. However, permits themselves are not open for public comment.

6.4 Special Public Participation Opportunities

A number of special public participation opportunities have occurred in the past and additional opportunities are occurring presently. These forums are typically aimed at policy level development. It is important to note that these ad hoc public participation and policy development methods were enacted only after conflicts developed.

6.4.1 Past Opportunities for Public Participation

Royal Commissions

There have been four Royal Commissions investigating forest practices in British Columbia in the last 81 years. The first, the Fulton Commission, occurred in 1909. It resulted in the passing of the first Forest Act in 1912 and proposed competitive, short term forms of tenure. At the end of World War II and again a decade later, there were two commissions headed by Mr. Justice Gordon Sloan. The first Sloan Commission in 1944-45 recommended a sustained yield policy for forestry in the province. It also recommended dividing the forests into large tenure units. The second Sloan Royal Commission in 1955-56 was undertaken as a follow-up to the first commission.

In 1975, the Minister of Lands, Forests and Water Resources established the Pearse Royal Commission to investigate timber rights and forest policy. This commission was established in response to a growing number of conflicts associated with forestry in the province. This enquiry resulted in the galvanizing of a variety of groups and their positions on the state of forestry practices in British Columbia. Public interest in being involved in forest planning was growing. This Royal Commission served as an excellent opportunity for the public to express its new-found interest. The Commission received a large number of public submissions, including some very detailed recommendations such as the Slocan Valley Community Forest Management Plan. The main recommendations of the Commission included:

- the best interest of the public is served by the forests remaining in public hands.
- proper development of the resources of the forest required proper planning.
- the Forest Act must undergo a complete overhaul.
- a separate Ministry of Forestry was required to conduct the integrated planning of the forest base.

As noted earlier in this chapter, as a result of the Commission's recommendations, a new Forest Act and the Ministry of Forests Act were enacted, and the Ministry of Forests was created in 1978.

Wilderness Advisory Committee

The mutually exclusive nature of wilderness and logging makes the conflict between the two land uses one of the most dominant conflict occurring in Provincial Forests. On November 15, 1986, in response to a series of disputes between the traditional resource users and the environmentalists, including the conflict at Lyell Island on South Moresby, the provincial Cabinet established the Wilderness Advisory Committee (WAC). This advisory committee was formed to provide the government with policy recommendations on wilderness.

The committee was composed of 8 individuals: 3 university academics, 2 with links to the forest and mining industry; 1 union representative (International Woodworkers of America); 1 mining industry representative; 1 forest industry representative; 1 environmentalist; and 1 lawyer skilled in negotiations. Generally, the committee's mandate was "to consider the place of wilderness in a changing society, one in which choices among resource uses will become increasingly difficult, and in which the decisions we make today will profoundly affect the lifestyle we enjoy tomorrow" (The Wilderness Advisory Committee 1987, 2). More specifically, the WAC was also asked to review the boundaries of 8 existing parks and review proposals for 16 new wilderness areas.

Within their short time 3 month mandate, the WAC attempted to make the process as open and accessible as possible to all interested parties. The level of public participation was astounding, especially considering the length of time allowed. The Committee received over

1100 written submissions and an additional 200 verbal presentations at the public meetings held by the WAC. Some of the key points brought forward by the public included:

- a clear definition of wilderness was required.
- some type of Wilderness Act was needed to protect wilderness, and to recognize wilderness as a resource on its own.
- both the Mining Act and the Forest Act required revisions to restrict the access of traditional resource users and to ensure the option of preserving wilderness is considered.

The Committee submitted its report to the Minister of Environment on March 7, 1987. In addition to specific recommendations for the 24 areas identified in the mandate, the WAC made a number of policy recommendations. These included that wilderness was a land use in its own right and that a new act (a natural areas protection act) was required. In addition, WAC recommended that future wilderness designations should be made in the context of an overall land use planning strategy, to ensure that the value of wilderness could be compared with traditional extractive uses of resources. Also, the establishment of a Natural Resources Advisory Council to review wilderness proposals, advise cabinet and involve the public in wilderness issues was recommended.

In reaction to the policy recommendations, the government disagreed that a new wilderness act was needed, and instead believed that existing legislation was sufficient. Three categories of wilderness for areas greater in size than 5000 hectares were established, wilderness areas in provincial forests, designated as such under an amended Forest Act. Logging is not allowed, but mining and petroleum exploration is permitted. The recommendation to establish the Natural Resources Advisory Council was not endorsed by the government.

6.4.2 Current Opportunities for Public Participation

Old Growth Working Group

Preservation of old growth is an important issue for forest management in the early 1990's, and is certainly one of the public's most important agenda items. In response to increasing public concern regarding the harvesting rate of the old growth stands in the provincial forests, the MoF sponsored an Old Growth Workshop in November 1989. The resulting recommendations formed the basis and impetus for the Minister of the MoF to establish the Old Growth Project in the spring of 1990 in which a working group acts as a policy advisory group. The working group is divided into five teams, each focusing on specific areas of interest and include: Ecological Research and Inventory; Old Growth Values; Policy Development; Management Practices; and Conservation of Areas.

The participants for each group were appointed by the government, and includes government, industry, labour, environmental, native, and academic representatives. The Project is to provide recommendations for the government by March 31, 1991. In addition to the workings of the advisory groups, the Project will hold a series of regional public meetings in November 1990 and a representative workshop in February 1991 (BC MoF Integrated Resources Branch 1990).

British Columbia Forest Resources Commission

During public hearings held in early 1989 concerning the conversion of various tenures into TFL's, the public voiced its dissatisfaction over general issues of forest practices and policy and requested the establishment of a royal commission. Instead, the British Columbia Forest Resources Commission was established as a permanent body of enquiry responsible for investigating issues in forest planning and management in British Columbia. The Commission serves only an advisory role to the government. Issues on which the Commission has been asked to advise the Forest Minister include a review of the tenure arrangement in BC, public participation in the MoF, and harvesting techniques.

Clayoquot Sound Task Force

The Clayoquot Sound Task Force was created outside the MoF, by the Provincial Cabinet. The Environment Minister and the Regional Development Minister announced the establishment of the task force on August 4, 1989. The Task Force represents an attempt at a political solution for a wilderness/tourism versus logging conflict. It is not part of the MoF's planning or public participation process, although the recommendations could have significant implications for planning and management in the MoF.

The composition of the Task Force initially did not include MoF representation, although one representative was added later. Other Task Force members include representatives from local and regional governments, forest industry, labour, other provincial ministries, and the native bands in the area. The Task Force is responsible for making recommendations to the government for a sustainable development strategy for the area.

Forest Land Use Liaison Committee

This independent committee, an example of the initiative style of public participation, is outside the governmental structure. Membership comes from the forest industry, government and environmental groups. The committee acts as a private discussion group that attempts to foster greater understanding between the three groups. Only occasionally has this group made a public statement.

6.5 New Directions

6.5.1 New MoF Policies

The MoF has adopted one policy and is in the process of developing another in response to the growing demand for the integration of all uses and participants in the planning process.

Integrated Resource Management Policy

The Integrated Resource Management Policy for Provincial Forests was adopted in July 1990 and states that "(A)ll provincial forestland will be managed according to Integrated Resource Management principles and practices . . . Integrated Resource Management [is] a process which identifies and considers all resource values along with social, economic and environmental needs" (BC MoF 1990, 1). Forest land planning will now be called Resource Management Planning. Public involvement was identified in this policy as essential to the success of integrated resource planning. One of the conditions of the policy is that "objectives for managing various resource uses on Provincial Forests will be defined and harmonized through a participative management style [including] between the Ministry and the public..."(BC MoF 1990, 2).

New Public Involvement Policy

Associated with the need to identify and consider all values and needs, the MoF is developing a new public involvement policy (Niezen 1990). The new policy is being designed to improve public participation opportunities and increase monitoring of the public involvement process (Niezen 1990). As a draft document, details of the policy have not been released and any further discussion of the new public involvement policy would be speculative.

6.5.2 Expanded Public Participation Opportunities

A number of districts in the MoF have attempted to integrate more public participation in the planning processes, including the Kispiox District in the Prince Rupert Forest Region during the development of the TSA Resource Management Plan.[33] Public representation and participation in this TSA planning process was more comprehensive than with the normal MoF public participation process. Initially, MoF staff identified more than 40 interest or user groups, and met with each group at the group's convenience. During the meetings, the planning process was described and a map of the region was used to identify all areas of concern and to inventory the group's values and important issues. The group was also asked to produce a written submission outlining the areas of concern and the group's management objectives. Any additional groups that were identified as absent during this first stage were included.

A public advisory group was formed from the organizations contacted, and they were then divided into 4 groups on the basis of their use of the resource: recreational, cultural, industrial, and other. Each group is chaired by a member of one of the interest groups. Each group is responsible for combining the issues and presenting their recommendations to the public. The planning team of the MoF then utilizes this information to produce options for the whole region after which the public is asked to narrow these option choices down to a small number that can be studied in detail. The MoF completes a technical review of these options. Finally, the MoF planning team presents detailed options to the public who make their recommendations. The final decision is then made by the Chief Forester who, without public participation, brings the provincial perspective into the analysis.

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[33] Information on the Kispiox District public participation process was provided by Brown (1990).

The Kamloops Forest Region is another area where regional MoF staff have attempted to expand the traditional opportunities for public participation. Here, using the more traditional planning process, the region makes full use of public meetings and workshops to consult with the public at various stages of the planning process, including at the issue generation stage and in reviewing various options (Ferguson 1990).

Chapter Seven

Evaluation and Recommendations

This evaluation of the effectiveness of the MoF's public participation process is based on theoretical and applied information from the literature and jurisdictional review. From these reviews, rationales and criteria for an effective public participation process were identified, and a list of the components that fulfill these criteria completed. The MoF will be evaluated based on the components listed below and thus the effectiveness of the public participation program:

1. Legal Mandate.
2. Understandable Process.
3. Democratic Accountability.
4. Comprehensive Public Participation Opportunities.
5. Proper and Adequate Notification.
6. Access to Information.
7. Adequate Resources for Participation.
8. Written Responses.
9. Conflict Resolution Mechanisms.
10. Appeal Mechanisms.
11. Commitment.

Legislation

Legislating the requirement and specific details of the public participation process appears to be the most important component of those listed, because it involves most of the other components. For example, a legislated public participation process can make the whole decision-making process more open and understandable, act as a standard to measure performance (accountability), establish the legal requirements for notification, written responses, ensure the opportunity for appeal and guarantee the right to comprehensive participation opportunities (non-discretionary). If the specific details of the public participation process are not included in the legislation itself, then these details should be included as legal regulations associated with the legislation, as is done in the United States for BLM and USFS regulations.

The MoF's public participation process is a policy requirement, with only vague reference in the legislation for consultation with the public. The policy stipulates only a few specific responsibilities and requirements, leaving implementation of the public participation process to the discretion of MoF staff. Ministerial policies offer only general policy guidance, and are not legally binding. Without specific requirements, it is difficult to determine responsibilities and measure actions and decisions taken by the government, and even more difficult to challenge those decisions (Vance 1990). Generally, too much discretion is left to the MoF staff in implementing the public participation process.

Recommendation:

1. **The public's right to participate in the planning and management processes of the MoF should be legally mandated through an amendment to the Forest Act (1979). The rights and roles of the participants and MoF staff, and the structure of the public participation process should be explicitly set out in legislation or in regulations associated with the Forest Act (1979) and Ministry of Forests Act (1979).**

Understandable Process

The public participation process, and the planning and decision-making process it accompanies must be clear and understandable to all participants and this understanding must be gained easily. An open process can instill more public confidence in the process, and lessen unnecessary conflicts. The opportunities to participate, responsibilities and roles of all participants and the restrictions and permissible outcomes of the planning process must be explicit. It is also important that the public participate in developing that process and help define the limits and objectives. If the public helps to develop the process, it will feel that it owns the process and there may be a reduction in the conflicts regarding the process itself.

There are few specific details of the MoF's public participation or planning processes in legislation or policy, and there is no public document that offers a comprehensive description of the planning and public participation processes in an easily understood format. The lack of a readily available, comprehensive description became apparent during the research for this study. The MoF depends on the initiative of the public to request participation opportunities, while the public must try to understand the process and determine the public participation opportunities from a variety of sources. The public also has limited input in the development of the planning and public participation processes in the MoF.

Recommendations:

2. **A comprehensive description of both the planning and public participation processes should be available to the public in an easily understood format. This document should include a description of the planning process, identification of the decision-makers and an outline of the opportunities for the public to participate.**

3. **The public should participate in the development of the public participation process, including defining the opportunities, the permissible limits and ranges.**

Democratic Accountability

Through the public participation process, the public must gain some level of empowerment or gain some influence on the decision-making process. This is one of the key characteristics identified in the literature.[34] However, it would be contrary to the democratic principle of accountability if decision-making authority is transferred to a non-accountable public representative or group.

Ultimate authority in the MoF is held by the elected Provincial Cabinet, although most of the decision-making authority is delegated to the Chief Forester, who is appointed to the position by Cabinet. The Chief Forester is accountable to Cabinet who in turn are accountable to the public through general elections. However, due to the "distance" between the public and the Chief Forester, and the influence of various interest groups who may have more direct contact with the Chief Forester than the general public, the level of accountability is questionable. However, as noted earlier, it is outside the scope of this project to enter into a discussion of institutional reform and the structure of decision-making authority. The general rule to retain is that public participation can increase the accountability of the decision-making process as long as the decision-maker remains democratically accountable in some fashion. This includes public representatives or public committees that may be given decision-making authority.

Recommendation:

4. **The decision-maker must always remain directly or indirectly democratically accountable.**

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[34] Refer to Arnstein (1970); Dunster (1988); Fraser (1990); Parenteau (1988); Praxis (1988) and Stanbury and Fulton (1988).

Comprehensive Public Participation Opportunities

Public participation should be comprehensive, occurring at all levels of the planning process, from policy development to monitoring the implementation of plans. Participation in policy development in the MoF is either adhoc and informal in nature or is restricted to relatively formal processes created in a response to specific issues. This reactive process is typically politically oriented and has included such temporary bodies as the Royal Commissions, the WAC and the Old Growth Working Group.

An effective method of public participation at the policy level would be to establish a permanent body for public input, such as a public advisory committee. This method would make both the policy development and the accompanying public participation process more pro-active. Utilizing an advisory body (or number of them) was suggested in the literature, recommended by the WAC in 1986 and is used in a number of the jurisdictions reviewed, most notably New Zealand. Advisory bodies such as QUANGOS serve as a permanent source of public advice and information at this more abstract level of planning, can carry out independent research, and can act as public participation watchdogs. The British Columbia Forest Resources Commission is a step in the right direction. However, the Commission does not have the freedom to decide the issues it wishes to investigate (the Minister directs the research direction). In addition, the public did not have the opportunity to give input or submit nominations for the selection of the members to the Committee.

Another method that should be utilized for public participation at the policy level is the review of policy discussion papers. The workshop style review of policy discussion papers allows the general public an opportunity to review draft policies and make suggestions before the policies are implemented.

Recommendations:

5. **An independent, permanent public advisory committee should be established to provide public input during policy development in the MoF. This body should be made up of public representatives, either elected directly by the public or appointed by the Minister from a list of individuals nominated by the public.**

6. **Public workshops should be used in conjunction with the advisory committee to allow the general public to review policy discussion papers.**

At the resource management plan level, only TSAs (and not TFLs) are subject to the policies of the MoF, including the public involvement policy. At this level, there is a large degree of discretion given to the regions and districts regarding the level and method of public participation incorporated with the planning process. The guiding principle of the MoF is that the public will inform the Ministry when they want public participation. The only specific requirement in policy for public participation in TFL planning is for issue identification and review of the draft TSA Resource Management Plan. Additional opportunities may be requested by the public and granted, including reviewing various reports such as Timber Supply and Recreation analyses, Statement of Issues, Scenarios and Procedures (SISP) reports, and options reports. However, reviewing completed documents allows only limited "participation". Constructive participation, that is more than a simple review of completed plans, is required throughout the planning process. In addition, TSA planning committees, which guide the planning process do not include public representation. The MoF has successfully utilized public advisory groups during TSA planning in the Kispiox District, allowing the public to actively participate throughout the process. The lessons and experiences of this planning process should be examined and incorporated in other TSA planning processes.

Recommendation:

7. Public participation should be required occur at all steps of the TSA planning process. In addition, a public advisory group should be formed for each individual TSA planning process to act as an additional sub-committee, or the planning team should include a representative of the public. The public sub-committee could provide public input to the Planning Committee and monitor the overall participation process.

Opportunities for public participation in TFL planning are very restrictive. Notification of initiation of the planning process and an opportunity to review the draft plan are the only opportunities for public participation required in the legislation. Any additional public participation opportunities are dependent on the goodwill of the TFL planning staff. While the Tree Farm License does bestow certain benefits and rights to the licensee, extensive public participation in the TFL planning process should occur, considering the public ownership of the resource. One method of increasing public participation in the TFL planning process would be to make the TFL licensee follow the TSA process. In this way, the public and the government would be assured that all interests are equally accounted for during the planning process, and the government could monitor the planning process.

Recommendation:

8. The TFL Licensee should be required to follow the TSA planning process, to ensure full public participation and government monitoring of the planning process.

Public participation during local-resource planning can vary from no participation to planning task forces. At this planning stage, the level of public participation is as discretionary as the type of planning mechanism used, both of which are dependent on the complexity and political profile of the issue. A majority of the monitoring for the MoF takes place at this planning level. However, the number of both formal and informal follow-up committees is limited (Niezen 1990). The experience of the Tsitika Valley follow-up committee, which includes public representation, has displayed the value of these monitoring bodies.

Recommendation:

9. **Public participation should be required during every local resource planning process. This includes membership on task forces or joint-planning teams and on follow-up (monitoring) committees.**

10. **The establishment of follow-up committees with public representation should be mandatory for each local resource plan.**

Proper and Adequate Notification

This component is closely associated with the requirement of an understandable process. To ensure full representation of all interests in the public participation process, the public must be given proper and timely notification. In the MoF planning process, the public is notified when a planning process begins, and when there is an opportunity to review a draft TSA Resource Management plan or TFL Management and Working plan. For the required public participation opportunities, the MoF does adequately notify the public. However, it would be desirable if the right to notification were based in legislation.

Recommendation:

11. **The Forest Act (1979) should be amended to require full and adequate notification of all public participation opportunities.**

Access to Information

Lack of access to relevant information is a significant limiting factor in the effectiveness of public participation. The new Access to Information policy for the MoF is not adequate to ensure the correction of this weakness. Rather, the ambiguous definitions of confidential and open information only maintain the status quo. Guarantees for the freedom of information should be set in legislation, as it has been done in a majority of the jurisdictions reviewed for this study. As noted earlier, a basic criterion for accessibility that could be used is the simple rule that all information used in a decision should be public. Any restriction of information must be narrowly defined, so that the public interest is not overrun by commercial interests (BC Ombudsman 1988).

The freedom of information legislation should include a description of the access rights, the restrictions that apply and the right to appeal any refusal to disclosure information. "It is the existence of the right to appeal which makes the right of access effective" (Hazell 1989, 195). Most jurisdictions reviewed have a two-level system of appeal, with either an administrative appeal or an appeal to the Ombudsman, followed by an independent tribunal or board. The freedom of Information legislation from the various jurisdictions should be reviewed during the development of this legislation.

Recommendation:

12. A Freedom of Information Act for British Columbia should be enacted. This Act should contain an explicit description of the rights and restrictions for the access to information. In addition, the right to appeal any refusal of disclosure must be guarantied.

Adequate Resources for Participation

Economic status should not be a limiting factor for public participation in the planning process. While government and industry have adequate resources to participate, most members of the general public and even many interest groups are limited by their economic status. Restricting participation on the basis of a lack of adequate resources undermines the democratic notion that all parties affected by a project can participate in the decision-making process. The MoF does provide logistical support for some formal participation opportunities, such as expenses and clerical support for advisory groups or task forces. "[L]ogistical support for Forest Service sanctioned involvement will be provided by the Forest Service"(BC MoF 1984, 12). However, intervenor funding is not provided by MoF.

Restrictions must be applied regarding who is qualified to receive funding, and how the monies may be spent to insure proper use of the public funds. Demonstration of a direct interest or connection with the area may be sufficient condition to receive funding (Parenteau (1988). The experiences of the Berger Inquiry and of the ERCB in Alberta should be examined prior to the development of these conditions.

Recommendation:

13. Intervenor funding should be available to ensure public participation in the planning process. This funding should be subject to certain restrictive conditions.

Written Responses

Written responses help make the public participation process accountable and credible. MoF policy requires written responses when the questions and recommendations from public participants are not utilized. "[A]ll questions and recommendations from the public will be responded to. Reasons for nonacceptance of recommendations must be provided "(BC MoF 1984, 12). The MoF responds to the participants questions and recommendation through either a direct response to the participant or through a summary in an appendix to the plan. This action by the MoF is very good, yet improvements can be made. Instead of limiting the written reasons to responding to participants concerns and recommendations, a complete written explanation of the rationale for the decision should be included, listing the criteria that the decision is based on. This requirement should also be based in legislation.

In addition, the policy requirement for an annual report (BC MoF 1984, s.2.16) outlining the public participation activities undertaken by the MoF has not been fulfilled since the early 1980's. It was decided that this report had little value (Niezen 1990). However, a summary of the public participation process would serve as an additional check on the planning activities of MoF.

Recommendations:

14. **The MoF should be required to provide written reasons for the decision made, outlining the criteria used in the decision and responding to the public's questions and submissions. This requirement must be legislated.**

15. **The requirement for an annual report outlining the public participation activities of that year should be legislated.**

Conflict Resolution

Conflict is an inherent part of the management of land and natural resources for which there is more than one use and more than one user. "As our communities become more pluralistic, as our natural resources become less abundant, as society becomes more interdependent and as international economic competition becomes more intense, it is clear that political polarization, public interest litigation and industrial confrontation are not the best answers (BC Ombudsman 1988, 30). The use of conflict resolution techniques may decrease the level of conflict, thus increasing the efficiency of the use of the forests. The MoF offers no conflict resolution services.

Recommendation:

16. An independent organization should be established to provide neutral facilitators and mediators to assist in negotiation and conflict resolution. The MoF should encourage the use of this service as a possible solution to conflict.

Appeal Mechanism

The right to appeal can act as an important check against administrative or political discretion in decision-making, but is not present in the MoF. The existence of an appeal mechanism can also encourage the development of a good planning process and ensure adherence to that process. In addition, if mediation cannot solve the conflict, an appeal is a constructive alternative to legal action, by offering a less complex and more efficient solution to conflict. A two-step process involving initially an internal administrative appeal and then a quasi-judicial appeal was exhibited to be the most efficient structure by a number of the jurisdictions reviewed.

It is important to define carefully the power of the appeal body, legitimate reasons for appeals and criteria for standing. A complete analysis of appeal bodies and processes is outside the scope of this report. However, some desirable characteristics include allowing appeals on the basis of procedural error, or if it can be proven that the best decision was not chosen. Standing should be limited to those individuals that were involved in the planning process or can prove that the decision affects them directly. In addition, the appeal body must have sufficient power to call witnesses, allow cross examination and make rulings. However, the powers of the appeal body must be restricted, such that the appeal body does not make planning decisions. The decision-making authority should not be transferred to an appeal body which does not have the same expertise or democratic accountability of the resource agency. Instead, the decision should be returned to the original decision-maker for re-evaluation, with concerns identified or conditions set by the appeal body.

Recommendation:

17. An independent appeal mechanism should be established for the MoF. The structure should include a two step process, with an administrative appeal followed by a quasi-judicial appeal. Standing, reasons for allowing an appeal and powers of the appeal body must be clearly defined.

Commitment

As noted earlier, commitment is one of the most important components of an effective public participation process, yet is very difficult to include in an evaluation of that process. It may be difficult to gain commitment to public participation from some staff due to the technical training of the majority of the MoF staff. Foresters are trained as scientists, and are often more comfortable in dealing with issues of efficiency and effectiveness (Vance 1990). The most effective method to ensure commitment to the public participation in the MoF (and increase the credibility of the process in the eyes of the public) is to establish a legally mandated public participation process, specifying the roles and responsibilities for the MoF.

Recommendations:

18. Commitment is best displayed by establishing a legally mandated public participation process with explicit requirements and responsibilities, and allocating sufficient resources and staff to conduct the public participation process

19. The MoF should provide additional training for their staff and hire personnel trained in public participation.

Chapter Eight

Summary

As displayed by the democratic and functional rationales identified in this project, it is in the public interest to include the public in the decision-making process. Direct public participation can shorten the line of accountability to the decision-makers, utilize public input and expertise and can ensure that an individual has the opportunity to participate in those decisions that impact his/her life. Public participation is most certainly a permanent and expanding component of the planning and management systems for public natural resources. This increasing demand for public participation is evident in British Columbia.

Specific requirements for public participation in the MoF planning process as required by policy or legislation are limited and this level of discretion does not encourage the development of an effective public participation process. Opportunities for public participation at the normative or strategic levels of planning in MoF are limited, and public participation at the lower levels of planning is often left to the discretion of the Region or District. Restricting the public from the TFL planning process effectively excludes public input for planning of a large percentage of the public forests.

The most important recommendation of the 19 made in this report is the need to legislate the public participation opportunities. A legally mandated public participation process ensures that the public has an opportunity to participate in the planning process, and clearly defines their rights and the responsibilities of the government. In addition, a majority of the other components recommended must be set in legislation for them to be effective. The establishment of an appeal body is important to ensure a check to the decision-making process. The recommendation to require TFL licensees to undergo the same public planning process as TSA licensees may be very unpopular with holders of TFLs, but is necessary to ensure public participation in all public land planning. The TFL licensee will still enjoy the other benefits of this type of tenure. In addition, although not identified as a specific component, the use of public advisory bodies is an important mechanism to achieve effective public participation. They should be used in policy development as a source of public information and values, during all steps of the TSA planning process and can act as a watchdog to ensure that all public interests have the opportunity to participate.

The question of efficiency of public participation processes will always be raised by opponents or skeptics of public participation. However, it instead may very well lead to more efficient and effective decisions in the long term.[35] Inclusion of the public into the planning and decision-making process can result in less conflict, better resolution of any conflicts, and increase the information and expertise available to the decision-makers.

Finally, there is the question of the proper institutional structure for the decision-making process. While the recommendations brought forward in this report can improve the public participation process at whatever level it resides, an improvement in the institutional structure may expand and reinforce the opportunities for public participation. The effectiveness of public participation decreases with the distance to the decision-maker (Parenteau 1988). Institutional reform may lead towards a decentralization of decision-making authority. This includes decentralizing government responsibilities and delegating decision-making power to elected and/or appointed local or region bodies.[36] While the question of institutional reform was not addressed in this report, the evaluation of the requirements for an effective public participation process sets the stage for discussion.

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[35] Refer to Nelson (1982); Smith (1984): and Stanbury and Fulton (1988).

[36] Refer to Dunster (1989); Fraser (1990); Hammond (1989); Man and Resources (1974); and Slocan Valley Community Forest Project (1975).

Reference List

Alaska. 1959. Alaska Statutes. 38.04.64 and AAC 555.020(b)

Alaska. Department of Natural Resources. Division of Land and Water Management. Resource Allocation Division. 1986. Planning Handbook. Anchorage.

Alberta. 1980. Land Surface and Conservation Act. R.S.A. 1980, c.L-3.

Alberta. Alberta Energy and Natural Resources. 1984. A Policy for Resource Management of the Eastern Slopes: Revised 1984. Edmonton.

Amy, D.J. 1987. The Politics of Environmental Mediation. New York: Columbia University Press.

Arnstein, S.R.. 1969. A Ladder of Citizen Participation. Journal of the American Institute of Planners July: 216-224.

Berger, T. 1977. Northern Frontier - Northern Homeland: The Report of the MacKenzie Valley Pipeline Inquiry. Vol.2. Ottawa: Minister of Supply and Services.

Blakney, J. Executive Director, Prince Edward Island Land Use Commission. 1990. Personal Telephone Communication. September 18, 1990. Charlottetown.

British Columbia. 1979a. Forest Act. R.S. 1979, c.140.

British Columbia. 1979b. Ministry of Forests Act. R.S. 1979, c.272.

British Columbia. 1979c. Range Act. R.S. 1979, c.355.

British Columbia. Ministry of Crown Lands. 1989. British Columbia Land Statistics. Victoria.

British Columbia. Ministry of Forests. 1981. Public Involvement Handbook. Victoria: Queen's Printer Publications.

British Columbia. Ministry of Forests. 1983. Public Involvement Policy. Victoria.

British Columbia. Ministry of Forests. 1984. Resource Planning Manual. Victoria.

British Columbia. Ministry of Forests. 1989. Access to Information Policy. Victoria.

British Columbia. Ministry of Forests. 1990. Integrated Resource Management Policy. Victoria.

British Columbia. Office of the Ombudsman. 1988. Annual Report to the Legislative Assembly. Victoria.

Brown, B. Planning Forester, Prince Rupert Region. British Columbia Ministry of Forests. 1990. Personal Telephone Communication. July 30, 1990. Smithers.

Canada. 1983. Access to Information Act. R.R.S. 1983, c.111.

Cohen, F.G.. 1986. Treaties on Trial. Seattle. University of Washington Press.

Council of Forest Industries. 1988. British Columbia Forest Industry Fact Book. Vancouver. Quoted in Master of Natural Resources Management Program. Wilderness and Forestry: Assessing the Cost of Comprehensive Wilderness Protection in British Columbia, 3. Vancouver.

Currie, D.A. Planning Forester, Resource Planning Section. Integrated Resources Branch. British Columbia Ministry of Forests. 1990. Personal Communication. July 11, 1990. Victoria.

Department of Natural Resources. 1988. Totem. 30:3.

Dunster, J. 1989. Concepts Underlying a Community Forest. Forest Planning Canada 5, no.6: 5-13.

Dunster, J.A. 1988. Conflict in Canadian Forestry. Doctoral Thesis in Philosophy. Waterloo.

Estrin, D. 1979. The Public is Still Voiceless: Some Negative Aspects of Public Hearings. In Involvement and Environment: Proceedings of the Canadian Conference on Public Participation, ed. B. Sadler, 2: . Calgary: Environment Council of Alberta.

Ferguson, D. Planning Inventory Officer, Kamloops Forest Region. British Columbia Ministry of Forests. 1990. Personal Telephone Communication. July 30, 1990. Kamloops.

Fraser, B., Senior partner of Salasan Associates Inc. 1990. Interview by author, 11 July, Victoria.

Gardner, J. 1989. What Happens to People Who Save Trees? Social Planning and Research Council News 6, no.1: 6.

Grzybowski, A.G.S. 1989a. New Zealand's New Environmental Administration: The Quest for Sustainable Development. IRSD Discussion Paper Series - Paper 1. Vancouver: Earthlife Canada Foundation.

Grzybowski, A.G.S. 1989b. Environmental Management in New South Wales Australia: One Approach to Legal Integration. Unpublished Manuscript. Vancouver.

Halbert, C.L. and K.N. Lee. 1990. The Timber, Fish and Wildlife Agreement: Implementing Alternate Dispute Resolution in Washington State. Upcoming in the Northwest Environmental Journal.

Halbert, C.L.. 1989. Supplement to the The Timber Fish and Wildlife Primer: A Guide to the Timber/Fish/Wildlife Agreement. Seattle: Institute for Environmental Studies, University of Washington.

Halbert, C.L.. 1989. The Timber Fish and Wildlife Primer: A Guide to the Timber/Fish/Wildlife Agreement. Seattle: Institute for Environmental Studies, University of Washington.

Hammond, H. 1989. Public Forests or Private Timber Supplies?...The Need for Community Control of British Columbia's Forests. Winlaw: Silva Ecosystem Consultants Ltd.

Hammond, H. and B. Egan. 1989. Initial Analysis of Forest Use in Clayoquot Sound. Unpublished report prepared for Friends of Clayoquot Sound. Winlaw: Silva Ecosystem Consultants Ltd.

Hazell, R. 1989. Freedom of Information in Australia, Canada and New Zealand. Public Administration 67, 189-210.

Huestis, D. Planning Forester, Port McNeil District. British Columbia Ministry of Forests. 1990. Personal Telephone Communication. July 12, 1990. Port McNeil.

Kamminga, G. Acting Director, Division of Forest Land Management. Washington State Department of Natural Resources. 1990. Personal Telephone Communication. September 19, 1990. Olympia.

Knopp, T.B. and E.S. Caldbeck. 1990. The Role of Participatory Democracy in Forest Management. Journal of Forestry 88, no.5: 13-18.

Lorensen, T. Land Use Planning Coordinator, Oregon Forestry Department. 1990. Personal Correspondence. January 30, 1990. Salem.

Lucas, A.R. 1976. Legal Foundations for Public Participation in Environmental Decision Making. Natural Resources Journal 16, no.1: 73-102.

M'Gonigle, M. 1986. The Tribune and the Tribe: Toward a Natural Law of the Market/Legal State. Ecology Law Quarterly 13, no.2: 233-310.

M'Gonigle, M. 1989. Developing Sustainability: A Native/Environmentalist Prescription for Third-Level Government. BC Studies no.84: 65-99.

Manitoba. 1985. The Freedom of Information Act. S.M. 1985, c.6.

Manitoba. 1987. The Environment Act. S.M. 1987, c.26.

Master of Natural Resources Management Program. 1990. Wilderness and Forestry: Assessing the Cost of Comprehensive Wilderness Protection in British Columbia. Vancouver.

McAllister, D.M. 1980. Evaluation in Environmental Planning: Assessing Environmental, Social, Economic and Political Trade-offs. Chapter 3 in Philosophy of Democracy. USA: MIT Press.

McLaren, C. 1989. Canadians want logging changed, poll finds. Globe and Mail May 19: A3. Quoted in Master of Natural Resources Management Program. Wilderness and Forestry: Assessing the Cost of Comprehensive Wilderness Protection in British Columbia, 7. Vancouver.

McLean, H.E. 1987. Pact and Impact: Ending the Northwest Logging Wars. American Forests. May/June: 28-31,65-69.

Morehead, A. and L. 1984. The New American Webster Handy College Dictionary. New York: American Library, Inc.

Naisbit J. and P. Aburdene. 1990. Megatrends 2000: Ten New Directions for the 1990's. New York: William Morrow and Company, Inc.

Naisbitt, J. 1982. Megatrends. New York: Warner Books.

Nelson, J.G. 1982. Public Participation in Comprehensive Resource and Environmental Management. Science and Public Policy October: 240-250.

New Brunswick. 1978. Right to Information. S.N.B. 1978, c.R-10.3.

New South Wales. 1979. The Environmental Planning and Assessment Act. 1979. (N.S.W. Aust.).

New South Wales. 1989. Freedom of Information Act. 1989, No.5, (N.S.W. Aust.).

New Zealand. 1982. The Official Information Act. S.N.Z. 1982, No.156.

New Zealand. 1986. The Environment Act. S.N.Z. 1986, No.127.

Newfoundland. 1981. Freedom of Information. R.S.N. 1981, c.5.

Niezen, A. 1987. The Efficiency and Effectiveness of Public Involvement in Multiple Use Issues in British Columbia. A Professional Report to the Association of British Columbia Provincial Foresters. Victoria.

Niezen, A. Analysis Forester - TFL, Forest Resource Analysis Section. Inventory Branch. British Columbia Ministry of Forests. Personal Communications. July - September 1990.

Northwest Territories. 1983. Basis of Agreement on Northern Land Use Planning. Yellowknife.

Northwest Territories. Department of Renewable Resources. 1985. Principles and Guidelines For Land Use in the Northwest Territories. Draft Discussion Paper. Yellowknife.

Nova Scotia. 1977. Freedom of Information Act. R.S.N.S. 1977, c.10.

Ontario. 1980. Environmental Assessment Act. R.S.O. 1980, c.140.

Ontario. 1987. Freedom of Information and Protection of Privacy Act. S.O. 1987, c.25.

Ontario. Ministry of Natural Resources. 1986. Timber Management Planning Manual for Crown Lands in Ontario. Toronto: Queens Printer.

Ontario. Ministry of Natural Resources. Planning Assessment Branch. 1988. Ministry of Natural Resources Policy Statement on Public Involvement in Planning Processes Leading to Decision-making In Resource Management. Toronto.

Ontario. Ministry of Natural Resources. Policy and Planning Secretariat. 1986. A Framework for Resource Managment Planning in the Ministry of Natural Resources. Toronto: Queens Printer.

Oregon. 1982. Forest Practices Act. O.R.S. c.526.

Oregon. 1987. Land Use Act. O.R.S. c.183 and 197.

Oregon. Department of Land Conservation and Development. 1986. Oregon's Statewide Planning Program - Summary. Eugene.

Osherenko, G. 1988. Can Co-management Save Artic Wildlife? Environment 30, no.6: 7-33.

Parenteau, R. 1988. Public Participation in Environmental Decision-making. Ottawa: Federal Environmental Assessment Review Office.

Pateman, C. 1970. Participation and Democratic Theory. London: Cambridge University Press.

Penny, S. Director, Green Peace. 1990. Personal Telephone Communication. July 1990.

Pinkerton, E.W. 1988. Co-operative Management of Local Fisheries: A route to Development. In Production and Autonomy: Anthropological Perspectives on Development, ed. J.W.Bennett and J.Bower. Lanham: University Press of America.

Pinkerton, E.W. 1989a. Rural Resource Planning in Coastal British Columbia: Can Fishing Communities Plan the Future of Their Fisheries? Plan Canada 29, no.2: 80-86.

Pinkerton, E.W., ed. 1989b. Co-operative Management of Local Fisheries. Vancouver: University of British Columbia Press.

Praxis Consulting. 1988. Public Involvement: Planning and Implementing Public Involvement Programs. Vol.1, 2 and 3. Unpublished report prepared for departmental agencies of the Canadian government . Calgary, Alta.

Prince Edward Island. 1988. Planning Act. R.S.P.E.I. 1988, c.P-8.

Quebec. 1979. Land Use Planning and Development Act. S.Q. 1979 c.51.

Quebec. 1982. Act Respecting Access to Documents Held by Public Bodies and the Protection of Personal Information. R.S.Q. 1982, c.30.

Ray, D. Manager of Timber Management Planning, Ministry of Natural Resources. 1990. Personal Telephone Communication. October 18, 1990. Ontario.

Richardson, T. 1982. The Chilliwack Supply Block Task Force: An Assessment of the Public Involvement Procedure Used. Vancouver: Information Services Branch, Ministry of Forests.

Sadler, B. 1978. Basic Issues in Public Participation: A Background Perspective. In Involvement and Environment: Proceedings of the Canadian Conference on Public Participation, ed. B. Sadler, 1: 1-12. Calgary: Environment Council of Alberta.

Saskatchewan. 1983. Planning and Development Act. R.S.S. 1983, c.P13-1.

Sewell, D.W.R. and T. O'Riordan. 1976. The Culture of Participation in Environmental Decision-making. In Natural Resources for a Democratic Society: Public Participation and Decision-making, ed. A.E. Utton et. al., 1-21. Boulder: Westview Press.

Slocan Valley Community Forest Management Project. 1974. Slocan Valley Community Forest Management Project: Final Report. Vancouver.

Smith, L.G. 1982. Alternative Mechanisms for Public Participation in Environmental Policy-Making. Environments 14, no.3: 21-34.

Smith, L.G. 1984. Public Participation in Policy Making: The State-of-the-Art In Canada. Geoforum 15, no.2: 253-259.

Smyth, S. Policy Analyst, Yukon Renewable Resources. Personal Telephone Communication. September 18, 1990. Whitehorse.

Stanbury, W.T. and M.J. Fulton. 1988. Consultation and Public Participation Processes in Government Policy Making: A Conceptual Framework. A revision of a paper originally presented at the Conference on Consultation Process in Business-Government Relations, Max Bell Center for Business-Government Studies, Faculty of Administrative Studies, York University, April 24-25, 1986.

Statistics Canada. 1990. Canadian Forestry Statistics 1987. Ottawa: Minister of Supply and Services.

Steiner, P.O. 1977. The Public Sector and the Public Interest. In Public Expenditure and Policy Analysis, ed. R.H. Haveman and J. Margolis, 27-66. Chicago: Rand McNally College Publishing Company.

Stone, E. Program Analyst, Bureau of Land Management. 1990. Personal Telephone Communication. March 1990. Portland.

Thompson, A. R. 1980. A Disciplined Framework for Public Participation. In Public Participation in Environmental Decision Making: Strategies for Change, ed. B. Sadler, 15-30. Calgary: Environment Council of Alberta.

Thornley, A. 1977. Theoretical Perspectives on Planning Participation. In Progress in Planning 7: 22-29.

Tipple, T.J. and J.D. Welman. 1989. Life in the Fishbowl: Public Participation Rewrites Public Foresters' Job Descriptions. Journal of Forestry 87, no.3, p.24-30.

U.S. 1966. The Freedom of Information Act of 1966. Pub. L. No.89-487; 80-Stat. 250.

U.S. 1970. National Environmental Policy Act of 1970. Pub. L. No.91-190; 83-Stat. 852.

U.S. 1976. Forest Land Planning and Management Act of 1976. 16 U.S.C. 1600 et.seq.

U.S. 1976. National Forest Management Act of 1976. Pub. L. No.94-588; 16 U.S.C. 1600 et.seq.

U.S. Department of Agriculture. Forest Service. 1982. National Forest System Land and Resource Management Planning Regulations. 36 C.F.R. 211, 217 and 219. Washington.

U.S. Department of Agriculture. Forest Service. 1984. Regional Guide for the Pacific Southwest Region. San Fransisco.

U.S. Department of Interior. Bureau of Land Management. 1984. Bureau Planning Manual: Prescribed Resource Management Planning Actions. Washington.

U.S Executive Office of the President. Council on Environmental Quality. 1986. Regulations for Implementing the Procedural Provisions of the National Environemtnal Policy Act. 40 C.F.R. 1500-1508. Washington: U.S. Government Printing Office.

Vance, J.E. 1990. Tree Planning: A Guide to Public Involvement in Forest Stewardship. Vancouver: B.C. Public Interest Advocacy Centre.

Waldo, J. 1988. Redefining Winning: The T.F.W. Process. Forest Planning Canada. 4,3: 14-19.

Warrener, J. Secretary/Technical Advisor. Manitoba Clean Environment Commission. 1990 Personal Telephone Communication. September 18, 1990. Winnipeg.

Washington State Forest Practices Board. 1987. Timber/Fish/Wildlife: A Better Future in Our Woods and Streams - Final Report. Olympia: Washington State Forest Practices Board.

Washington. Department of Natural Resources. 1986. Tiger Mountain State Forest Management Plan. Olympia.

Welbourn, M. Manager, Management and Resources Planning Unit. Alaska Department of Natural Resources. 1990. Personal Telephone Communication. September 17, 1990. Anchorage.

Wilderness Advisory Committee. 1987. The Wilderness Mosaic. Victoria: The Wilderness Advisory Committee.

Yukon. 1987. Agreement on Land Use Planning in the Yukon Between the Government of Canada and the Government of the Yukon. Whitehorse.

ORGANIZATION AND STRUCTURES OF CROWN LAND PLANNING IN SELECTED JURISDICTIONS

Background Report Prepared for the

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1. INTRODUCTION

The purpose of this report is to describe existing procedures for crown (or state) land planning in selected jurisdictions. The jurisdictions include all Canadian provinces, except for British Columbia which is addressed in a companion report, the territories and several foreign jurisdictions.

The foreign jurisdictions have been selected on the basis of potential relevance to British Columbia. Washington, Oregon and Alaska have been chosen because of the similarity in resource issues and Australia and New Zealand were chosen because of the similarity in legal and governmental origins.

The Report commences with a discussion of an alternative administrative framework for describing land use planning systems. This framework is then applied to selected jurisdictions. The key alternatives are then summarized in the conclusion.

The Report involves only a description of the various planning systems. No attempt is made to provide a comprehensive evaluation. However, the description of existing structures is useful in identifying the strategic options open to British Columbia for reforming the forest land planning process.

2. LAND USE PLANNING: A DESCRIPTIVE FRAMEWORK

2.1 INTRODUCTION

The first task of the study team was to establish an evaluative framework for appraising land use institutions and processes in different jurisdictions. The team examined land use planning in eighteen different jurisdictions and identified certain specific and fundamental characteristics or components to be used in framing an analysis of land use planning institutions in those jurisdictions.

Two major elements were established as a framework for evaluating the institutional aspects of planning in each jurisdiction: planning processes and planning products. In relation to planning processes, eleven components were identified (see Fig. 2.1 below).

2.2 PLANNING PROCESSES

This section describes the key components of the Crown land use planning process for each jurisdiction. Crown (or state) lands comprise publicly owned lands. The components for the Crown land use planning process are based on a similar format to that developed by Mitchell and Turkheim (1977) for describing environmental impact assessment processes in Canada. The components for the land use planning framework are identified in Figure 2.1 and described below.

Figure 2.1

Crown Land Use Planning Process List of Components

A - Legislative Base
B - Jurisdiction and Authority
C - Planning Area
D - Time Frame
E - Initiation of Planning
F - Public Participation
G - Conflict Resolution Mechanisms
H - Monitoring and Enforcement
I - Review
J - Appeal Procedures
K - Environmental Impact Assessment(EIA)

A) Legislative Base

How land use planning is operationalized requires an examination of the dominant legislation which establishes the planning process. The primary legislation for Crown land use planning in each jurisdiction is identified along with the date that the legislation came into force. The legislation may be general and only address land use issues indirectly. As a result, the planning for Crown lands may be more ad hoc and discretionary. Alternatively, the legislation may be specific and explicitly include the details of the land use planning process.

All planning processes begin with the conferring of a mandate on a legislatively created institution. The mandate may carry varying degrees of authority. The component describes the legal basis for the planning process and whether it is based on a constitution, on legislation, on regulations, on a policy, or on guidelines. A constitutional mandate has legal force and is more difficult to amend than legislation. Legislation is legally binding, but it may only provide the skeleton of the planning process (Estrin and Swaigen, 1978). The key decisions and details of the planning process may be discretionary or subject to regulations, policy or guidelines. Regulations have legal force, but they are easier to change than legislation.

Policy is usually a general statement of goals and objectives that is issued at the ministerial level. A policy gives general directives to the bureaucracy but is not legally binding. Guidelines are a form of policy (Estrin and Swaigen, 1978) but are more concrete than a broad statement of goals and objectives. Guidelines are essentially a "how-to manual" and can be general or specific. Guidelines may have legal force, and they are less discretionary than broad statements of policy. Policy and guidelines provide flexibility, but they may be more difficult to enforce than legislation or regulations.

In 1988, the Ombudsman of B.C. recommended that a comprehensive legislative foundation should be provided to enhance fairness, certainty and predictability in integrated resource management. In particular, a legal framework should be established in situations where conflicts are anticipated. The exercise of discretion should also occur within a structured framework to enhance public confidence. Criteria for decision-making should be clearly defined where discretion is to be exercised. These criteria should also be published.

B) Jurisdiction and Authority

This component describes the lines of authority or responsibility for the development and implementation of policies and plans. Thus both the structure of planning authorities and the process for decision making are addressed, and flowcharts for the planning framework in each jurisdiction are included in the jurisdictional descriptions

Institutions may be seen as social decision systems which, by defining the working rules, accommodate change and reconcile conflicting demands (Lang and Armour, 1980).

According to Fox (1976) the task of institutional design is to secure a distribution of resources among groups and a set of rules governing their behaviour which will produce decisions which actually reflect the desires of society. Methods of achieving objectives such as these vary greatly. Although ultimate authority will usually reside with the legislature in a given jurisdiction, organizational developments range from highly centralized decision making authorities to centralized/decentralized modes where authority is delegated to lower levels of government (Fabos, 1985).

As well, provisions must be made in institutional design to balance sectoral, organizational (eg. different government agencies with an interest in the same resource) and regional groups in order to facilitate the realization of social goals.

C) Planning Area

The planning area identifies the spatial or geographical component of the planning process. For example, planning may occur on a national, state/provincial, regional or local level. The nature of the functions and relationships between the functions at the different levels are also described.

Dominant legislation or policy at the regional level covers a broader range of functions than at the local level. Legislation or policy at the local level tends to cover private land use and development within municipal boundaries. Municipal control does not normally extend to Crown lands, resource management, and federal and provincial government activities (Richardson, 1989).

Richardson(1989) suggests that a suitable framework for ecosystem-based planning can only occur at the regional level. The region provides an important link between broad policy objectives and the actual day-to-day operation and administration of plans. Most land use and economic development priorities also need to be resolved at the regional level.

D) Time Frame

The time frame describes the amount of time required to prepare a plan and the amount of time needed to review a plan. The amount of time required to prepare and review a plan is described in terms of months or years. The time frame for preparing and reviewing a plan provides an indication of the overall efficiency of the planning process.

E) Initiation of Planning

The initiation of planning describes how the planning process begins. For example, the planning process may be systematic, responsive or selective. A systematic planning process is based on the ideal planning model. An ideal model occurs sequentially beginning with the establishment of goals and objectives, the formulation and evaluation of all feasible alternatives, the selection and implementation of the preferred alternative, and continuous monitoring and feedback (McLoughlin, 1969; Hall, 1975). The ideal model also aims to be pro-active and identify planning problems or issues before they arise. The ideal model is rarely achieved in practice. As Hall(1975) has noted, an increasing knowledge of the external environment may lead to unpredictable results, interactions among different planning levels and actors are complex, and values change over time and may be difficult to reconcile.

A responsive planning process is not based on the ideal planning model. Instead a responsive planning process is re-active and occurs when a land use conflict or problem arises. A responsive planning process may be ad hoc and is not necessarily based on legislation or policy. Finally, a sectoral planning process may be systematic or responsive, but would only apply to certain projects or resource sectors.

F) Public Participation

The process for public involvement is a key characteristic necessary for ensuring that planning reflects public concerns. The characteristics of public involvement are treated briefly in this report as they are discussed in detail in a companion report. Those wishing more detail should see the report by Brenneis.

G) Conflict Resolution Mechanisms

Conflict resolution is a means of resolving disputes among competing or conflicting interests. This component identifies the mechanisms that are available for resolving conflicts with the public and describes the main characteristics of such mechanisms. For example, conflict resolution may include the creation of new or separate institutions, or may involve negotiations within existing institutional structures. Conflict resolution mechanisms are further characterized as ad hoc or as components of more formalized processes. Examples of special conflict resolution mechanisms include an ombudsman or arbitration board, the appointment of a special mediator, or the establishment of Commissions of Inquiry, temporary Advisory Committees, or Royal Commissions.

The B.C. Task Force on Environment and Economy(1989) considers conflict and dispute resolution as fundamental to the achievement of sustainable development. The Task Force believes that with the correct mechanisms many disputes concerning the environment and economic development can be resolved. The Task Force states that parties have a right to their own values. These values can be maintained in mediated disputes. Mediation attempts to gain agreement on the process first and then on the problem. The Task Force suggests that "profoundly creative solutions" can be reached through mediation.

In 1988, the Ombudsman of B.C. recommended the use of consensual conflict resolution mechanisms rather than litigation to resolve public interest disputes. The adversarial process does not necessarily lead to "enduring solutions." Consensual conflict resolution involves negotiation rather than litigation, and focuses on creative alternatives in order to reconcile competing interests. A trusted, neutral facilitator or mediator may be required to ensure balanced participation and full disclosure. The Ombudsman suggests that the government should take a leadership role in promoting consensual conflict resolution.

H) Monitoring and Enforcement

Monitoring is a process for obtaining feedback on the effectiveness of a plan during implementation and enforcement is a means of ensuring compliance with a plan. Monitoring checks to see if the controls for implementing the plan have been effective or whether modifications are required(McLoughlin, 1969; Hall, 1975). Monitoring may also lead to a re-direction of the plan to better fit the realities of the world. Enforcement aims to ensure that the controls for implementing the plan are put into action.

Monitoring and enforcement are described as mandatory or discretionary, and comprehensive or selective. For example, monitoring and enforcement may be mandatory and required by legislation or policy. Alternatively, monitoring and enforcement may be discretionary which does not guarantee that they will be carried out. A comprehensive monitoring and enforcement process would include all plans and resource sectors. A selective monitoring and enforcement process, on the other hand, would only include certain plans, projects, or resource sectors.

I) Review

A periodic review of plans is considered to be part of a properly conducted land use planning process(Richardson, 1989). The lack of periodic review or revision of plans is often a weakness of plans and planning(Davis, 1976). A plan may often be subject to review, but no clear mechanisms or directives are provided for this review. Planning is a dynamic process and periodic review allows the plan or process to be revised as experience and knowledge are acquired.

McLoughlin(1969) suggests that in terms of urban and regional planning, a plan and its control mechanisms should be reviewed at both short and large intervals. A short interval would involve a minor review, whereas a large interval would involve a more major review.

A commitment to plan review may be difficult to make in advance as budgets and competing financial demands change over time (Davis, 1976). Davis(1976) suggests that periodic review is of major importance for plans such as agriculture and forestry which do not involve a permanent land allocation. Periodic review is less critical where the land use commitment extends over a long period of time.

The review component identifies whether a provision for periodic review of a plan exists and the main character of the review process. In particular, review is described in terms of whether it is mandatory or discretionary, and comprehensive or selective.

J) Appeal procedures

Appeal procedures define whether decisions, and the process used to make decisions can be questioned by the public or other concerned parties. The actual operation of the appeal procedures are also identified. Appeal procedures may be mandatory or discretionary. The appeal procedures may also be comprehensive and encompass all resource sectors and the entire planning process, or they may be selective to certain resource sectors or parts of the planning process.

The Ombudsman of B.C.(1988) has suggested that to ensure public confidence, an independent, statutory appeal process is important for any process that regulates fundamental interests. The appeal process should also be available without excessive cost. The appeal body should also have technical expertise. In addition, at least one member of the appeal body should have expertise in administrative fairness. The appeal body should also have the power to hear evidence and call witnesses, and substitute its decision for that of the administrative agency where necessary.

K) Environmental Impact Assessment (EIA)

Environmental impact assessment (EIA) is defined as "a process or set of activities designed to contribute pertinent environmental information to project or program decision-making" (Beanlands & Duinker, 1983). During the last twenty years, EIA has become a well-established part of the development process in many countries of the world. The procedural and administrative aspects of EIA have undergone considerable review and refinement. More recent concerns have focussed on the scientific basis for impact assessment, and the lack of project monitoring and follow-up.

The current approach to EIA is often static. Studies predict impacts and then the assessment process ends after the project has been approved. Holling et al (1978) suggest that EIA should be part of an ongoing, dynamic process which begins with project conception and carries on through project implementation. All impacts cannot be predicted in advance and a monitoring program is essential.

The Ombudsman of B.C.(1988) suggests that an efficient, independent mechanism is needed for the assessment of environmental and social impacts. This mechanism is particularly important where impacts are difficult to predict accurately and where the magnitude of adverse impacts may be significant. An administratively fair system of impact assessment involves the unbiased collection of data and predictions. A threshold should be established at which point EIA should be conducted. The system of environmental and social impact assessment should also be time and cost-efficient.

The EIA component identifies the role that EIA plays in the planning process and the degree of coverage of the EIA process. The role of EIA may be described as mandatory or discretionary, and integral or separate. The U.S. National Environmental Policy Act, 1969, is an example of a mandatory legislatively based EIA process. Many EIA processes in Canada, in contrast, are discretionary and are based on administrative procedures rather than on legislation. Discretion provides for flexibility, but it may also be abused. As an integral component, EIA would be conducted as part of the land use planning process and would likely be required by policy or legislation. EIA could also be a separate component, and may occur as a distinct process to the land use planning process.

The degree of coverage of the EIA process defines whether EIA is comprehensive or selective. For example, to be comprehensive, EIA would be included in the planning for all resource sectors, projects, and plans. Alternatively, to be selective, EIA would only be conducted for specific projects or resource sectors.

2.3 PLANNING PRODUCTS

The planning product is the output of the planning process. The planning product may include broad philosophical statements, principles or guidelines, specific policies, procedures for land management or allocation, or specific development plans. The planning product is described in terms of the type of output generated for each planning area, and the relationship between the different products produced. The main distinguishing features of the planning product are also identified. For example, the planning product may be based on a single resource use or it may involve the integration of a number of different resource uses.

3. LAND USE PLANNING IN EIGHTEEN JURISDICTIONS

In this section land use planning processes and planning products in eighteen different jurisdictions are examined.

The jurisdictions encompass all Canadian provinces except British Columbia, the territories, Alaska, Oregon, the US Bureau of Land Management, the US Forest Service, New Zealand and New South Wales, Australia.

3.1 ALBERTA

The Alberta government owns and administers 416,000 km^2 of land, 63% of the provincial land base. Administration of Crown lands for planning purposes is divided between areas classed as "green", considered as forest lands, and "white" (non-forest) areas. The Public Lands Division of the Department of Forestry, Lands and Wildlife is responsible for settled areas and the Alberta Forest Service administers forested and other Crown lands.

Figure 3.1 - Provincial Resource Management Agency Involvement. Source: Integrated Resource Planning: The Alberta Experience, 1987, pg 7.

There are currently eleven provincial government departments with responsibilities for administering more than 25 resource related acts of legislation in Alberta. The planning process is administered by the Department of Forestry, Lands and Wildlife. The Public Lands Division of the Ministry administers Crown land within settled areas while forested Crown lands are the responsibility of the Alberta Forest Service.

A) LEGISLATIVE BASE

Figure 3.2 - Planning Authorities Diagram

Planning and management of public lands is primarily legislated in the Public Lands Act R.S.A. 1980 . Integrated resource planning in the province is not specifically legislated but is authorized under this act. The planning process has been implemented through policy rather than legislative reform. The Energy Resources Conservation Board, created under the Land Surface Conservation Act R.S.A. 1973, hears concerns involving recreation complexes, energy-related and water resource projects.

B) JURISDICTION AND AUTHORITY

A hierarchy of interdepartmental committees, from Cabinet to planning team level, review and approve planning products. Interagency disagreements which cannot be resolved at one level are referred to a higher level for resolution. Each of the committees make decisions on a consensus basis, with acceptance of committee recommendations dependent upon the discretion of individual committee members. The hierarchy of committees aims for a downward flow of policy direction and an upward flow of information and draft resource management proposals.

The following individuals or groups are involved in the planning process:

Associate Minister of Public Lands and Wildlife - The elected official responsible for initiating planning proposals.

Alberta Integrated Planning Advisory Committee (AIPAC) - This committee provides advice to the Associate Minister of Public Lands and Wildlife regarding provincial planning issues. It is composed of representatives from 12 provincial industrial and public interest groups with an interest in resource management and planning.

Cabinet Committee on Economic Planning - The committee is at a ministerial level and is responsible for final approval of integrated resource planning products. The Associate Minister of Public Lands and Wildlife initiates consideration of plans by the Cabinet committee.

Figure 3.1

Provincial Resource Management Agency Involvement in Integrated Resource Planning

Department/Agency	EP	NRCC*	NRAC*	RIC	RRMCs	PTs+	Con.+
1. Forestry, Lands and Wildlife	X	X					
a) Alberta Forest Service			X	X	X	X	X
b) Fish and Wildlife Division			X	X	X	X	
c) Public Lands Division			X	X	X	X	X
2. Energy	X	X	X	X	(X)	X	X
3. Environment	X	X	X	X	(X)	X	X
4. Agriculture	X	X	X	X	(X)	X	X
5. Tourism	X	X	X	X	(X)	X	X
6. Transportaion and Utilities	X	X	X			X	X
7. Recreation and Parks		X	X	X	(X)	X	X
8. Economic Development	X	X	X				X
9. Municipal Affairs		X	X	X		X	X
10. Energy Resources Conservation Board		X	X	X	(X)	X	X
11. Culture				X	(X)	X	X

* Agencies listed do not represent the full membership of the committee.

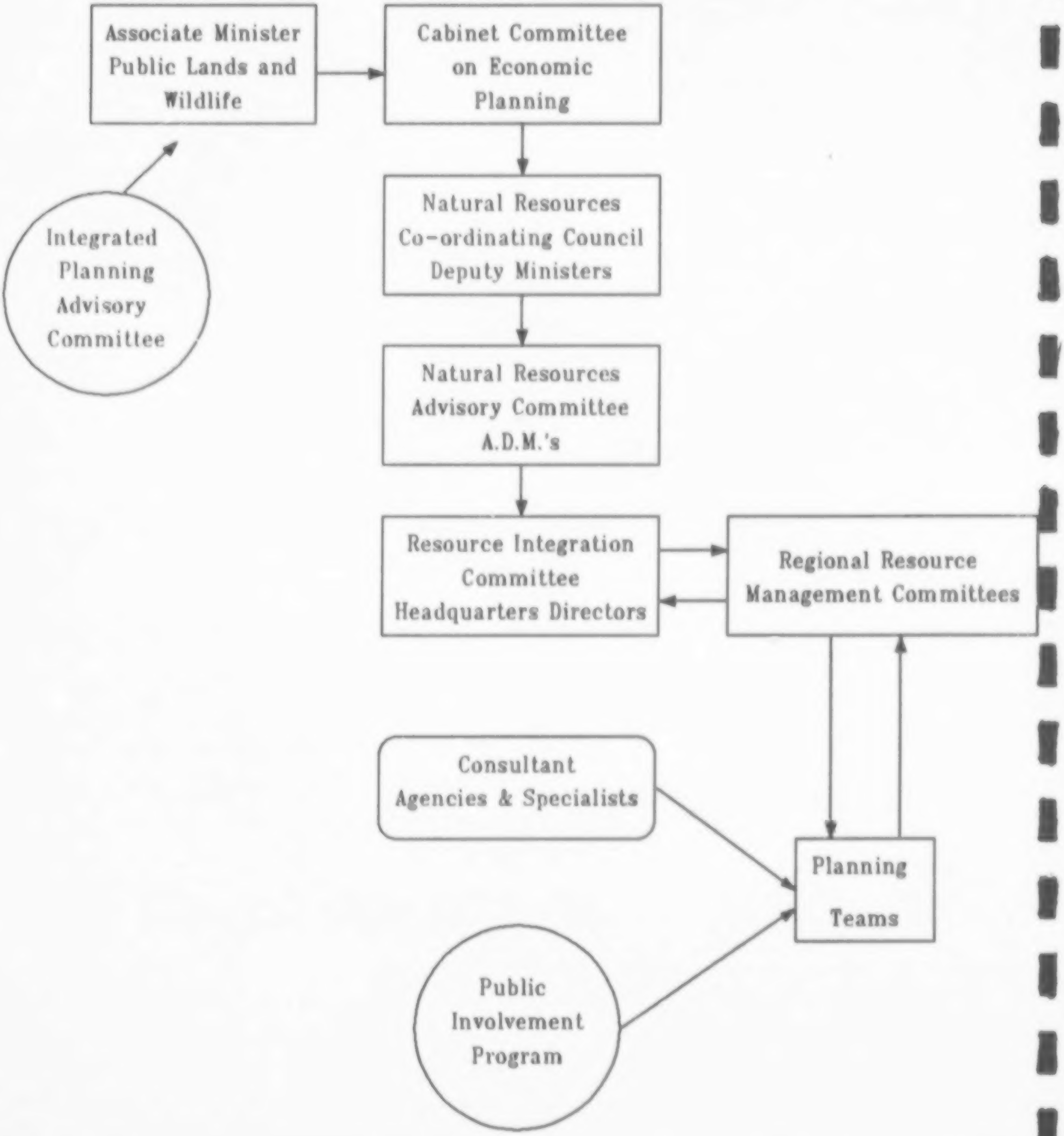
+ Agency involvement varies with plans.

(X) Participate as required on specific plans and issues.

Legend:

EP – Cabinet Committee on Economic Planning (Ministers)
NRCC – Natural Resources Co-ordinating Council (Deputy Ministers)
NRAC – Natural Resources Advisory Committee (Assistant Deputy Ministers)
RIC – Resource Integration Committee (Headquarters Directors)
RRMCs – Regional Resource Management Committees (Regional Directors)
PTs – Planning Teams (Field Level Staff)
Con. – Consultants to Planning Teams

Figure 3.2
Planning Authorities


Associate Minister Public Lands and Wildlife
Cabinet Committee on Economic Planning
Integrated Planning Advisory Committee
Natural Resources Co-ordinating Council Deputy Ministers
Natural Resources Advisory Committee A.D.M.'s
Resource Integration Committee Headquarters Directors
Regional Resource Management Committees
Consultant Agencies & Specialists
Planning Teams
Public Involvement Program

Natural Resource Coordinating Council - This deputy minister level council is responsible for intermediate review and approval of planning products. The Deputy Minister of Forestry, Lands and Wildlife initiates consideration of plans by the council and recommends approval to the Minister of Forestry, Lands and Wildlife when support of the council has been obtained.

Natural Resources Advisory Committee - This committee, composed of assistant deputy ministers, is responsible for intermediate review and approval of integrated resource plans. The committee also ratifies planning priorities on an annual basis. The Assistant Deputy Minister of the Resource Evaluation and Planning Division of the Department of Forestry, Lands and Wildlife coordinates discussion and recommends plans to the Deputy Minister of Forestry, Lands and Wildlife when committee approval has been received.

Resource Integration Committee - This director-level committee is the primary interdepartmental steering and coordinating committee for integrated resource planning in Alberta. The committee identifies planning priorities, recommends planning programs and provides detailed direction to planning teams, including interpretation of policy direction. The director of the Resource Planning Branch of the Resource Evaluation and Planning Division acts as chair of the committee and coordinates review and approval of planning products.

Regional Resource Management Committees - There are currently five of these committees, composed of regional directors from four of the divisions of Forestry, Lands and Wildlife. Representatives of other agencies participate on the committees when issues under their jurisdiction are being discussed. The committees are the first level of review and approval above the planning teams. They are responsible for identifying planning priorities and providing direction to planning teams, as well as being heavily involved in the implementation of integrated resource plans. A regional resource coordinator from the Resource Evaluation and Planning Division chairs each Regional Resource Management Committee.

Planning Teams - Planning teams are interdepartmental and usually consist of one representative from each of the divisions of Forestry, Lands and Wildlife plus representatives from other agencies with major resource management responsibilities in the planning area. Each planning team is led by a planner from the Resource Planning Branch who is responsible for overall coordination of the process. The Resource Evaluation and Planning Division provides technical support to the team.

Consultants - Provincial government resource management agencies have the option of becoming consultants to the planning team if their interests in a planning area are not significant enough to justify a representative on the team. Consultants to the team have the opportunity to comment when issues which relate to their jurisdiction are discussed and as planning documents are produced. Consultative status is also open to federal government agencies and local authorities, including members of the Legislative Assembly, municipal districts, improvement districts, counties and regional planning commissions.

C) PLANNING PROCESS

Figure 3.3 - Planning Process Diagram

Integrated resource planning originated in the province in the 1970's as a component of resource management in the Eastern Slopes region of the Rocky Mountains. In 1973, the provincial Environmental Conservation Authority conducted major public hearings on land use in the region and in subsequent recommendations to the government, strongly stressed the need for integrated resource policies and land use planning for the area. In 1976, the Resource Planning Branch of Alberta Energy and Natural Resources was created to provide integrated resource plans to facilitate the optimum use of public lands in the province. In 1978, the Deputy Minister level Natural Resources Coordinating Council approved an interdepartmental integrated resource management and planning system for the province, coordinated by the Resource Planning Branch.

A hierarchy of interdepartmental committees (Figure 3.4) reviews the planning process and approve planning products. Interagency disagreements which cannot be resolved at one level are referred to a higher level for resolution. Each of the committees make decisions on a consensus basis, with acceptance of committee recommendations dependent upon the discretion of individual committee members. The hierarchy of committees aims for a downward flow of policy direction and an upward flow of information and draft resource management proposals.

Most integrated planning projects undertaken to date in Alberta have been initiated in response to identified resource management problems. The Associate Minister of Public Lands and Wildlife is responsible for initiating integrated resource plans and bringing planning products forward for Cabinet consideration. Final authority rests with the Economic Planning and Resource Development Cabinet Committee.

An outlined sequence of steps is followed in preparing the plan. The initiation stage involves problem identification, schedule and procedure for decision-making. The planning team is then responsible for developing terms of reference in cooperation with the involved Regional Resource Management Committee. The process continues through the identification of resource objectives and policy alternatives, inter-agency negotiation, and preparation of draft and final plans.

Public Involvement

Public involvement is obtained at two stages in the overall process. First, the Alberta Integrated Planning Advisory Committee (AIPAC) provides advice to the Associate Minister of Public Lands and Wildlife regarding provincial planning issues. Then, at the planning team level local representatives of AIPAC organizations and other organized interest groups are involved through a defined public involvement program. Individuals and groups who use or are interested in an area are provided opportunities to review and comment on plans as they are produced. Open houses, newsletters and information exchange meetings are used to provide public information and to solicit comment.

The Energy Resources Conservation Board holds public hearings on projects related to energy development. The Board provides intervener funding to affected groups and its decisions may be appealed through the courts. This is not true of other governmental planning processes: no funding is provided and there is no appeal mechanism, the cabinet having absolute discretion in decision making.

Figure 3.3
Planning Process

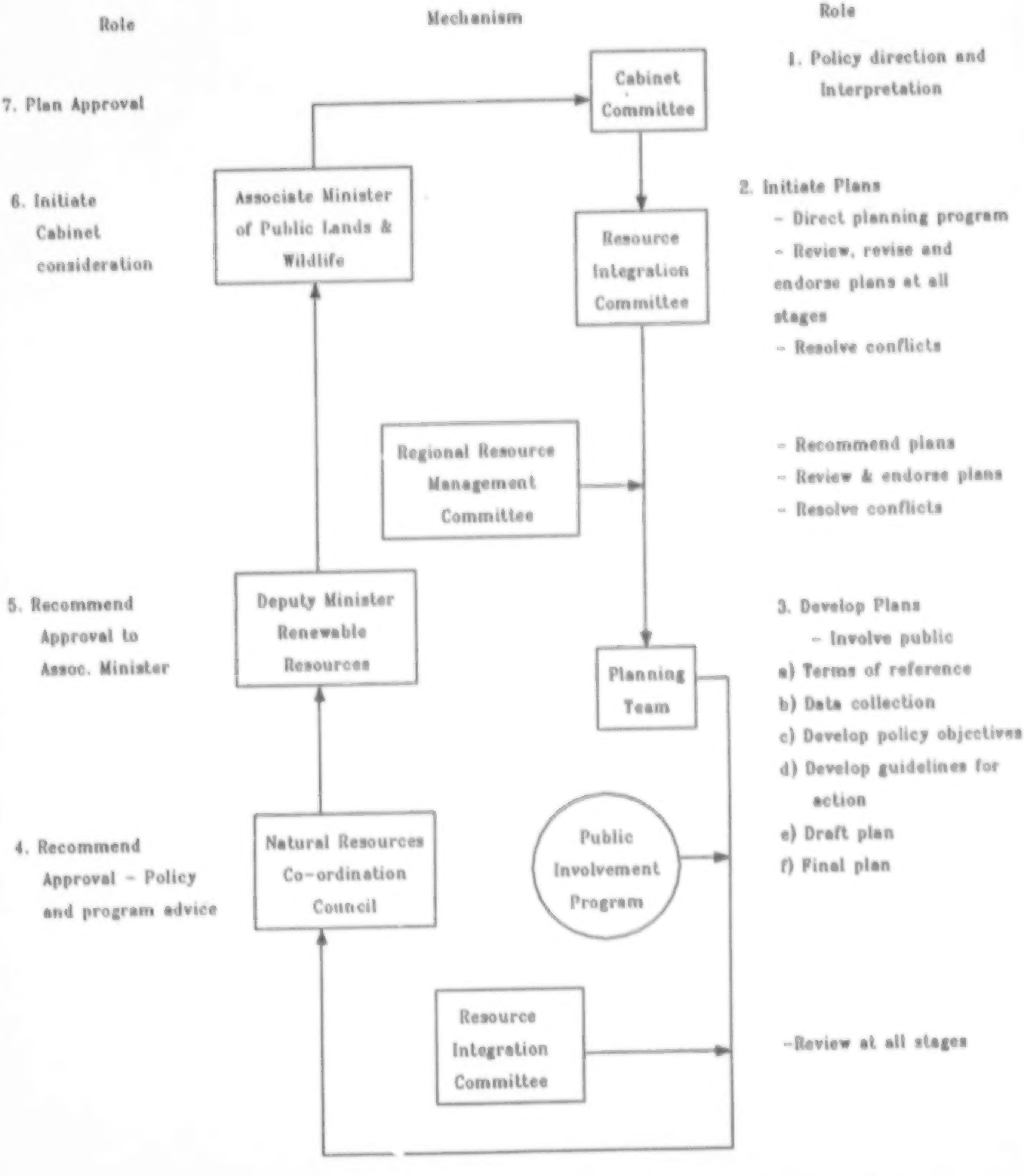
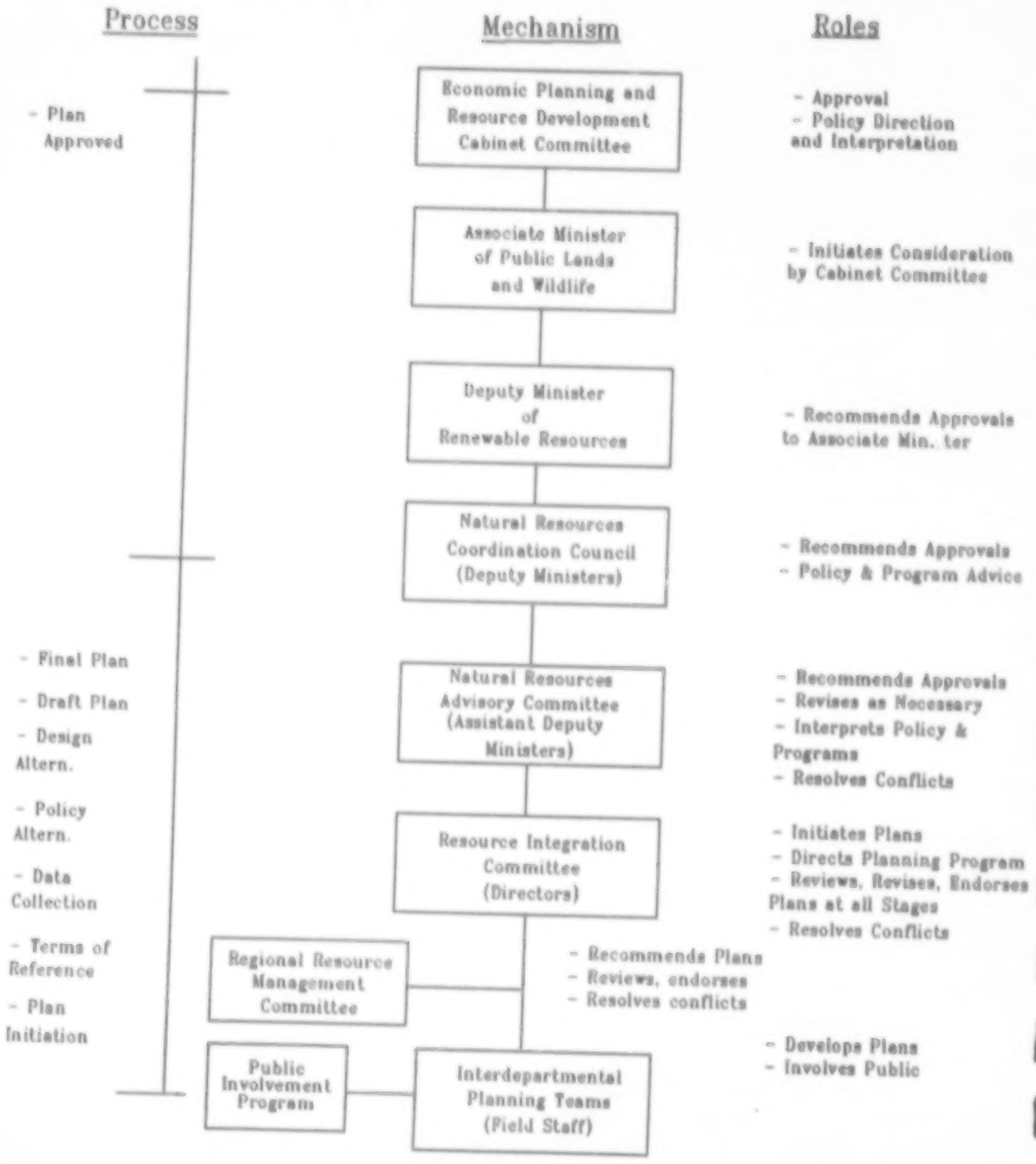

Role
Mechanism
Role
1. Policy direction and Interpretation
7. Plan Approval
Cabinet Committee
6. Initiate Cabinet consideration
Associate Minister of Public Lands & Wildlife
Resource Integration Committee
2. Initiate Plans
- Direct planning program
- Review, revise and endorse plans at all stages
- Resolve conflicts
Regional Resource Management Committee
- Recommend plans
- Review & endorse plans
- Resolve conflicts
5. Recommend Approval to Assoc. Minister
Deputy Minister Renewable Resources
Planning Team
3. Develop Plans
- Involve public
a) Terms of reference
b) Data collection
c) Develop policy objectives
d) Develop guidelines for action
e) Draft plan
f) Final plan
4. Recommend Approval - Policy and program advice
Natural Resources Co-ordination Council
Public Involvement Program
Resource Integration Committee
-Review at all stages

Figure 3.4
Integrated Resource Planning
Approval Process


Process
Mechanism
Roles
- Plan Approved
Economic Planning and Resource Development Cabinet Committee
- Approval
- Policy Direction and Interpretation
Associate Minister of Public Lands and Wildlife
- Initiates Consideration by Cabinet Committee
Deputy Minister of Renewable Resources
- Recommends Approvals to Associate Minister
Natural Resources Coordination Council (Deputy Ministers)
- Recommends Approvals
- Policy & Program Advice
- Final Plan
- Draft Plan
- Design Altern.
- Policy Altern.
- Data Collection
- Terms of Reference
- Plan Initiation
Natural Resources Advisory Committee (Assistant Deputy Ministers)
- Recommends Approvals
- Revises as Necessary
- Interprets Policy & Programs
- Resolves Conflicts
Resource Integration Committee (Directors)
- Initiates Plans
- Directs Planning Program
- Reviews, Revises, Endorses Plans at all Stages
- Resolves Conflicts
Regional Resource Management Committee
- Recommends Plans
- Reviews, endorses
- Resolves conflicts
Public Involvement Program
Interdepartmental Planning Teams (Field Staff)
- Develops Plans
- Involves Public

Subsequent to the allocation process, fewer provisions are made for public involvement in the use of Crown land. For example, Forest Management Agreements covering large areas of forest land are approved by Cabinet with little public input. Public input can only take place after the fact by requests to cabinet for amendments to the plan.

Each plan must be reviewed every five years and monitoring, which differs by region and activity, appears to be at the discretion of the regional Directors

Environmental impact assessment

Environmental impact assessment in Alberta is established under the Land Surface Conservation and Reclamation Act R.S.A. 1973. The Minister of the Environment has the discretion to require an E.I.A. if, in the Minister's opinion, the development will have a significant adverse environmental impact. Government policy requires E.I.A.'s on major energy-related projects, recreation complexes and water resource developments. The E.I.A. process is administered by the Environmental Assessment Division of Alberta Environment.

D) PLANNING PRODUCTS

Figure 3.5 - Planning Tools Diagram

Three levels of integrated resource planning are identified in the Alberta planning process: regional; subregional; and local. Each level of planning is aimed towards providing resource management direction and a framework for more detailed levels of planning. Most plans to date have been initiated on the basis of impending or actual resource conflicts rather than on a systematic procedure. Thus, a hierarchy of planning direction is not in place for all areas. The planning framework for lower level plans has often been developed using best available resource management direction, rather than actual higher level plans.

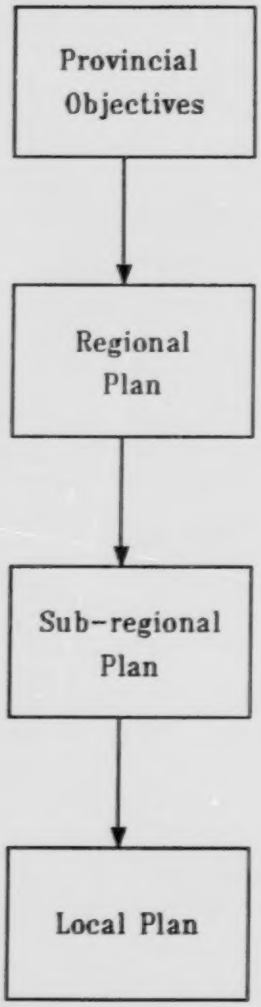
Regional level resource planning deals with the development of planning direction for broad areas of the province at a scale of 1:250,000. The goals of regional plans are to provide a general allocation of resources, taking into account provincial objectives and to identify planning priorities within the region. The five administrative regions of the Department of Forestry, Lands and Wildlife provide the geographic basis for regional plans. One regional plan has been completed and approved as part of A Policy for Resource Management in the Eastern Slopes, Revised 1984. Regional plans, involving senior resource management staff, are in preparation in the other four regions.

Sub-regional level resource planning involves the development of planning direction for identified areas on a 1:100,000 scale. The goal of sub-regional plans is to identify desirable patterns of land use and an appropriate mix of resource use activities. The Alberta integrated resource planning process has focused on sub-regional plans over the past several years. Field level resource managers have been heavily involved in plan development.

Local level resource planning aims to provide direction for smaller planning areas by developing detailed land and resource use parameters. They are mapped at scales from 1:50,000 to 1:15,000. Field level resource managers are the main participants in producing local plans. Plans are implemented at the regional level by the resource managers.

Figure 3.5

Planning Tools


Provincial Objectives
Regional Plan
Sub-regional Plan
Local Plan

1 : 250,000 Scale
Identifies planning priorities
for the region

1 : 100,000 Scale
Identifies desirable patterns of land use and
mix of activities - resource priorities
- allocation of land uses

1 : 50,000 - 1 : 15,000 Scale
Detailed land and resource
use parameters

3.2 ONTARIO

Approximately 87% of the total land area in Ontario is Crown land. Primary responsibility for Crown lands lies with the Ministry of Natural Resources (MNR).

Provincial ministries and other levels of government which require provincial Crown land request it through the Ministry of Natural Resources. Transfer of administration and control is subsequently arranged by Order-in-Council of the provincial Cabinet.

A) LEGISLATIVE BASE

The jurisdiction for provincial Crown land rests with the Land Management Branch of the Ministry of Natural Resources. The Branch administers both the Public Lands Act and the Mining Act, which provide the statutory authority for managing and disposing of rights in Crown lands.

B) JURISDICTION AND AUTHORITY

There is a three tier structure which manages government land use policy in Ontario. The first tier is the provincial Cabinet, which has ultimate responsibility for land policy.

Figure 3.6 - Structure of Provincial Policy Making Process. Source: Land Use Programs in Canada Figure 1 pg 28.

On the second tier are the Policy Field Committees, which are interministerial secretariats which report directly to Cabinet. There are three secretariats, with the Provincial Secretariat for Resources Development having the most effect on land use policies. The Provincial Land Use Committee of this secretariat is responsible for coordination and articulation of land use oriented policies. Issues are referred to the Provincial Secretariats when unresolvable interdepartmental conflicts arise. The Secretariats can also request studies from individual ministries and initiate studies requiring active interministerial participation.

The third tier and the most specific comprises the Ministries. The Ministries are responsible for most of the day to day decision making involving land use. There are some twenty ministries involved to some degree in land use policy in the province. Natural Resources has the primary jurisdiction for Crown land, with other ministries influencing policies including: Agriculture and Food, Environment, Housing, Northern Affairs, and Transportation and Communications.

Two special committees have particular influence on land use policies, the Advisory Committee on Regional Development (ACORD) and the Provincial-Municipal Liaison Committee (PMLC). ACORD is a Deputy Minister level committee with the objective of relating government programs to ministerial programs. The PMLC consists of the Provincial Treasurer, other Cabinet members and the Municipal-Liaison Committee. It is designed to promote a useful exchange of information between provincial and municipal representatives.

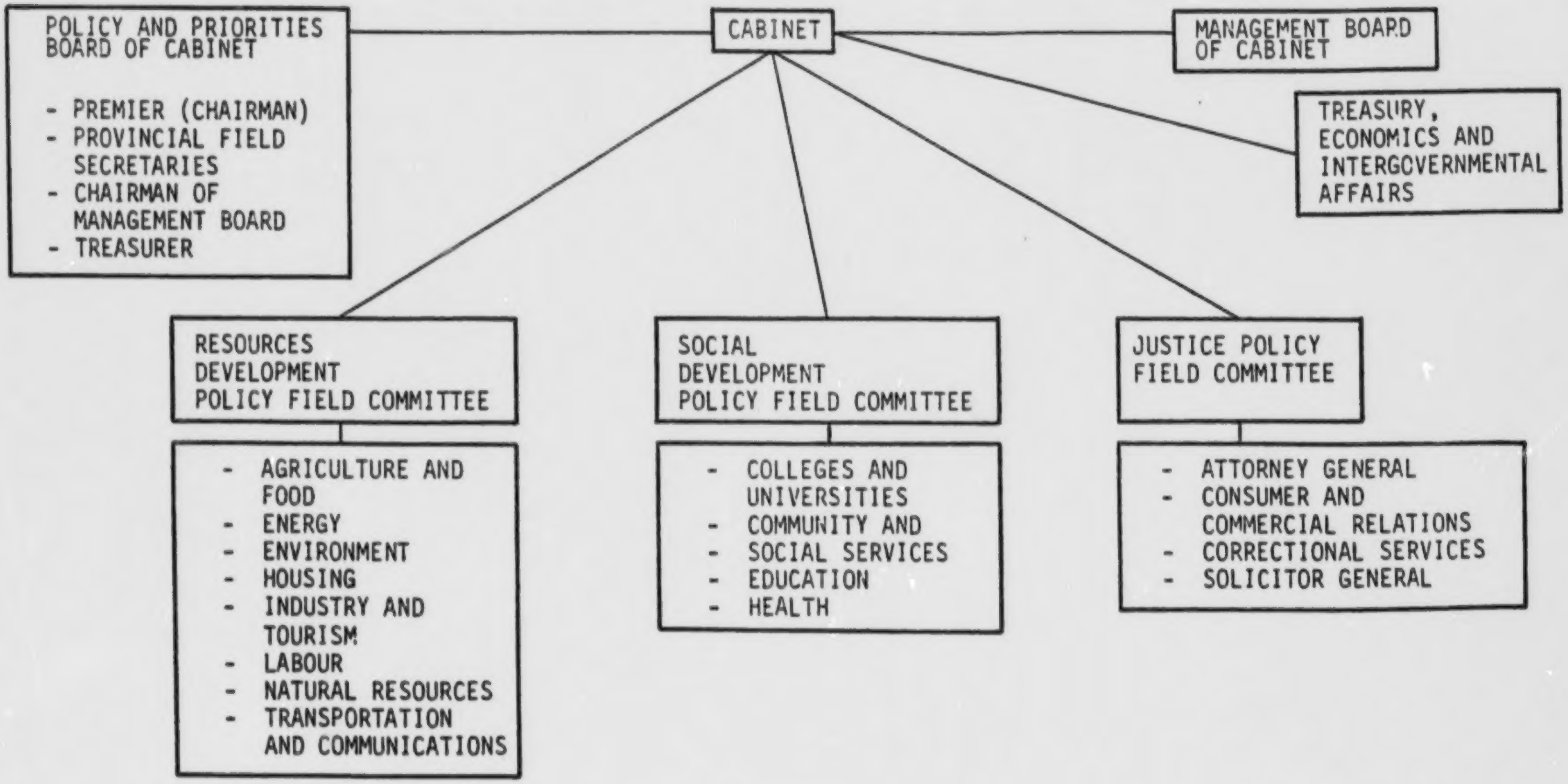
C) PLANNING PROCESS

Figure 3.7 - Planning Relationships, in Framework for Resource Mgt Planning in MNR, Table 1 pg 5.

Figure 3.6

STRUCTURE OF PROVINCIAL

POLICY MAKING PROCESS


CABINET
POLICY AND PRIORITIES BOARD OF CABINET
- PREMIER (CHAIRMAN)
- PROVINCIAL FIELD SECRETARIES
- CHAIRMAN OF MANAGEMENT BOARD
- TREASURER
MANAGEMENT BOARD OF CABINET
TREASURY, ECONOMICS AND INTERGOVERNMENTAL AFFAIRS
RESOURCES DEVELOPMENT POLICY FIELD COMMITTEE
- AGRICULTURE AND FOOD
- ENERGY
- ENVIRONMENT
- HOUSING
- INDUSTRY AND TOURISM
- LABOUR
- NATURAL RESOURCES
- TRANSPORTATION AND COMMUNICATIONS
SOCIAL DEVELOPMENT POLICY FIELD COMMITTEE
- COLLEGES AND UNIVERSITIES
- COMMUNITY AND
- SOCIAL SERVICES
- EDUCATION
- HEALTH
JUSTICE POLICY FIELD COMMITTEE
- ATTORNEY GENERAL
- CONSUMER AND COMMERCIAL RELATIONS
- CORRECTIONAL SERVICES
- SOLICITOR GENERAL

Strategic planning for Crown lands in the province was initiated by the Ministry of Natural Resources in the 1970s primarily as a systematic approach to resource allocation in northern Ontario. The strategic planning approach involves consideration of long-term goals; a coordinated approach of varying degrees of detail between planning levels; and public consultation. District land use guidelines were approved in 1983.

The MNR planning process is in many ways a textbook planning exercise. It starts with defined goals and proceeds step by step through a predetermined sequence of elaboration and refinement to detailed land use plans. The process is very much top down, with district policies and targets defined by those of the regions, and theirs in turn determined by those of the MNR.

The first stage of the Strategic Land Use Planning(SLUP) process, which is initiated at the discretion of the Minister, is the establishment of terms of reference by the MNR, followed by collection of information and the determination of ministry policies and objectives by reconciling those of its individual branches. Objectives essentially take the form of specific sectoral production targets.

At the regional level, a similar procedure is followed. At this stage, conceptual land use plans are prepared and economic targets assigned to individual administrative districts.

At the district level, the procedure is again repeated. Detailed land use plans with the intention of meeting targets are prepared, together with review procedures.

The time frame specified for establishing timber management plans is 13-15 months. They are reviewed every 5 years. A standard term is not generally specified for other resource management plans. Park management plans, for example, are reviewed every 5 or 10 years or as necessary.

Public participation

The Ministry of Natural Resources has a policy on public consultation setting out a comprehensive but discretionary process. The intent of the policy is to ensure interested members of the public have an opportunity for input and influence on provincial resource management and land use policy decisions.

Environmental impact assessment

Figure 3.8 - Review procedure under the Environmental Assessment Act.

The Consolidated Hearings Act 1981 (CH Act) provides for a single joint board to review undertakings that involve environmental and related land use issues which could be subject to public hearings under twelve other provincial statutes. These statutes, listed in the act's Schedule, include: the Environmental Assessment Act (EA Act), the Environmental Protection Act (EP Act), the Ontario Water Resources Act (OWR Act), the Municipal Act and the Planning Act. The Consolidated Hearings Act binds the Crown.

The Environmental Assessment Board may be called upon to hold hearings under the EA Act, the EP Act and the OWR Act. Under the EP Act, the Director of Approvals may require the Board to conduct hearings when considering an application for a Certificate of Approval for a waste disposal site or waste management system. The Board recommends to the director whether or not to grant the approval as well as terms and

Figure 3.7 PLANNING RELATIONSHIPS

LEVELS OF PLANNING		TARGETS	GEOGRAPHICAL EXTENT	TIME HORIZON	PUBLIC CONSULTATION	INTEGRATION STRATEGIES	APPROVAL*
STRATEGIC LAND USE PLANNING	PLANNING REGIONS . NWSLUP . NESLUP . SOCPS	. Specific targets for each program, at a planning region level	Planning Regions . N.W. . N.E. . S. Ont.	20 years	. Mandatory . Broadest possible public(s) involved . Multiple techniques . Open Houses . News releases . Public Forums	. Program Policies and targets undergo some integration during preparation and approval in order to minimize conflicts	Deputy Minister
	DISTRICT LAND USE GUIDE-LINES	. Specific targets for each program, at a district level	DISTRICT	20 years	. Mandatory . Broadest possible public(s) involved . Multiple techniques . Open Houses . News releases . Public Forums	. Integration strategies established as set of principles . Targets are tested to ensure they can be met	Regional Director and District Manager
RESOURCE MANAGEMENT PLANNING	MANAGEMENT LEVEL	. DLUG targets are basis . Assigns portion(s) of DLUG target to the area of mgmt. plan . May refine targets into smaller units based on species or other more specific breakdown . Identifies strategies and priorities to meet targets	. Normally sub-district e.g. . Resource Areas from DLUG . Provincial Park . Wildlife Mgmnt. Area . Crown Mgmnt. Unit . In some cases, may be District: e.g. for Fisheries	20 years	. Mandatory . Involved publics may be selected . Deal with those directly involved or affected . Inform public as a whole through news release, etc. . Techniques may be more selective	. Linkages to other programs is crucial and can be accomplished through: - joint or combined mgmt plans - setting priorities among District's plans and coordinating their scheduling - plans are prepared by a team of affected or involved parties - cross-reference to other plans . Circulation and review of plans	# Regional Director and District Manager Director .Timber Sales Br. .Pks & Rec Areas Br.
	OPERATING LEVEL	. Targets, strategies and priorities from Mgmnt. Plan are basis. . Contains specific projects and actions; in priority . Should be easily translated into a multi-year work plan.	. Normally, same as associated management plan . In some cases, may be a sub-unit of the mgmt plan as identified in the mgmt. plan	5 years	. Mandatory . Similar to 'Management Level' . If all decisions on allocation and project definition have been made, consultation may be limited to specific interest groups.	. At this level, integration occurs through, . joint projects . integrating priorities and schedules . circulation and review of plans . specific management prescriptions	# Regional Director & District Manager
WORK PLANNING		. Targets are transposed to OUTPUT MEASURES	NOT APPLICABLE	One (fiscal) year	. Project review may be required through environmental assessment procedures	. Individual projects in the work plan can combine measures to effect integration	Regional Director & District Manager

* Note: Exceptions to the levels of approval may occur.

# It is intended that there not be two distinct levels of planning process or two distinct plan documents. Refer to Section 6 for further explanation.

conditions of the approval. Similarly under the OWR Act, the Director may require the Environmental Assessment Board to hold hearings and submit recommendations in consideration of an application for a designated sewage project.

If, however, a Joint Board rather than an Environmental Assessment Board is convened under the Consolidated Hearings Act, it is the Joint Board and not the Director that decides upon the undertaking. Unlike boards under the EA Act, the EP Act or the OWR Act, a Joint Board under the CH Act may award costs to hearing participants.

The Environmental Assessment Act outlines the EA process in Ontario. The Act binds the Crown. Undertakings may be put forward for approval on either an individual or class basis. A Class EA is prepared for certain types of projects which: have common characteristics, are carried out in very similar circumstances, recur frequently and have a predictable range of effects. Another notable feature of the EA Act is that the proponent is required not only to provide an assessment of the proposed undertaking, but also a description of alternatives to it.

The Environmental Assessment Process involves two discrete decisions. First, acceptance of the EA document to determine if it provides an adequate basis for the Minister or the Environmental Assessment Board to make a decision. The second decision involves approval of the undertaking; either the Minister or the Board may approve or reject an undertaking.

The Environmental Assessment Board reports directly to the Minister of the Environment. On the direction of the Minister, it holds public hearings, reviews the EA and approves the undertaking. The Board is a permanent body consisting of a minimum of five members chosen by Cabinet from outside the Ontario public service. It's proceedings are quasi-judicial in form, with the Board determining its own practice and procedures subject to Cabinet approval and consistency with the Statutory Powers Procedures Act. Anyone may have standing before the Board on request. Hearings are open to the public except in limited situations when the Board decides that sensitive matters are involved.

The Environmental Assessment Advisory Committee consists of members of the public appointed by the Minister to advise on designating and exempting undertakings, or on other process or policy matters. The Committee may hold a public meeting when appropriate. Committee reports are submitted to the Minister and made public after Ministerial decision regarding the undertaking.

D) PLANNING PRODUCTS

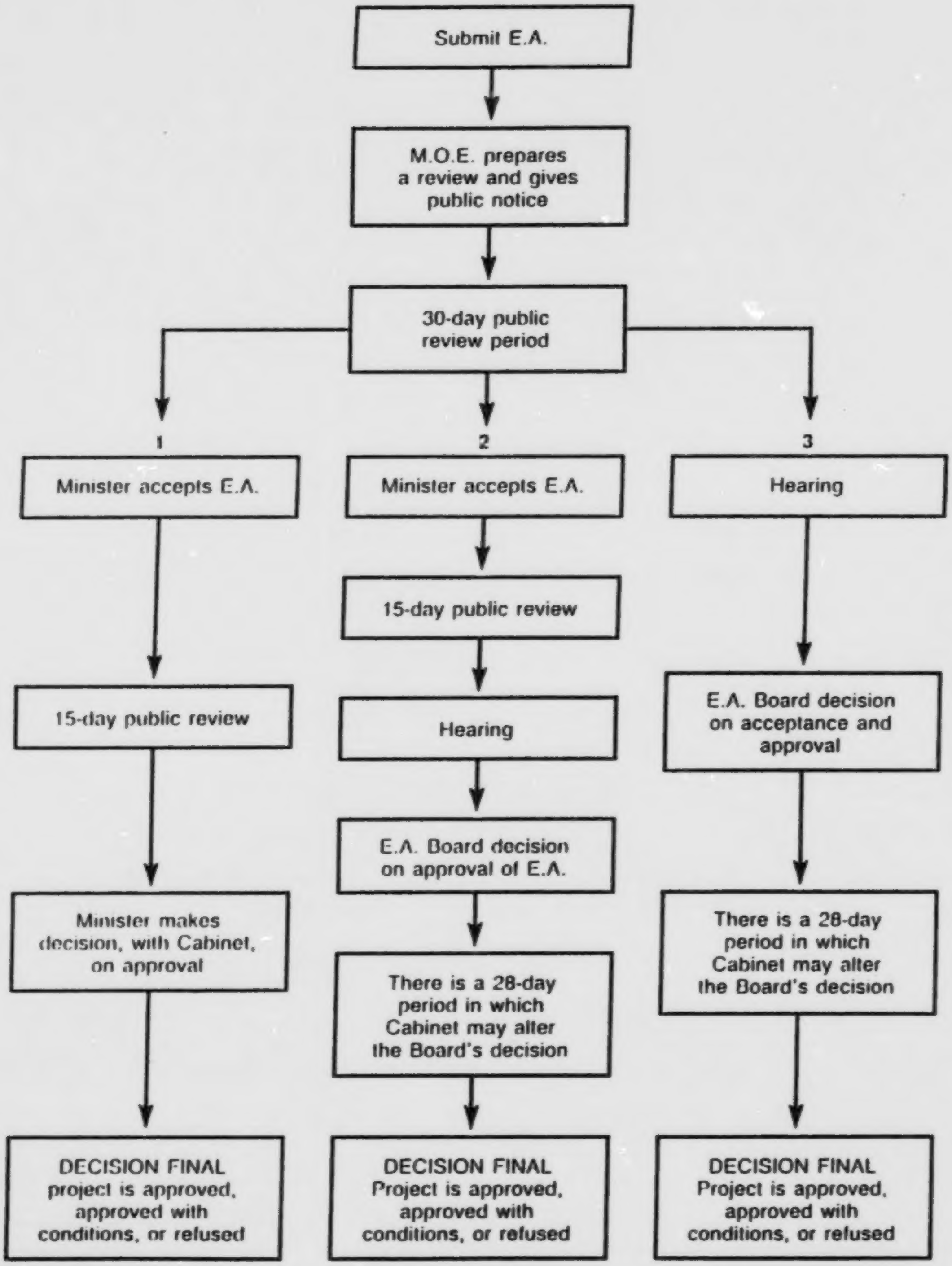
Figure 3.9 - Administrative and Planning Regions NW SLUP Map 1
Figure 3.10 - MNR Corporate Framework, in Framework for Resource Mgt Planning in MNR, pg 4.
Figure 3.11 - Planning Tools

Strategic Land Use Plans

The Strategic Land Use Plan process (SLUP) is the major planning process involving Crown lands in Ontario. It is carried out by, and largely within, the MNR with requirements for public consultation. The process is designed to proceed from a provincial to a regional and finally to a local level. These are regional plans (Figure 3.7) intended to

Figure 3.8

REVIEW PROCEDURE UNDER THE ENVIRONMENTAL ASSESSMENT ACT


Submit E.A.
M.O.E. prepares a review and gives public notice
30-day public review period
1
2
3
Minister accepts E.A.
Minister accepts E.A.
Hearing
15-day public review
E.A. Board decision on acceptance and approval
15-day public review
Hearing
E.A. Board decision on approval of E.A.
Minister makes decision, with Cabinet, on approval
There is a 28-day period in which Cabinet may alter the Board's decision
There is a 28-day period in which Cabinet may alter the Board's decision
DECISION FINAL project is approved, approved with conditions, or refused
DECISION FINAL Project is approved, approved with conditions, or refused
DECISION FINAL Project is approved, approved with conditions, or refused

NOTE: E.A. refers to Environmental Assessment
M.O.E. refers to Ministry of the Environment

Ministry of Natural Resources Administrative Regions and Planning Regions

Figure 3.9

- ☐ Administrative region boundary.
- ☐ Planning region boundary.
- ● Regional headquarters.

Planning Regions	Administrative Regions
NORTHWESTERN	1 Northwestern 2 North Central
NORTHEASTERN	3 Northern 4 Northeastern
SOUTHERN	5 Algonquin 6 Eastern 7 Central 8 Southwestern

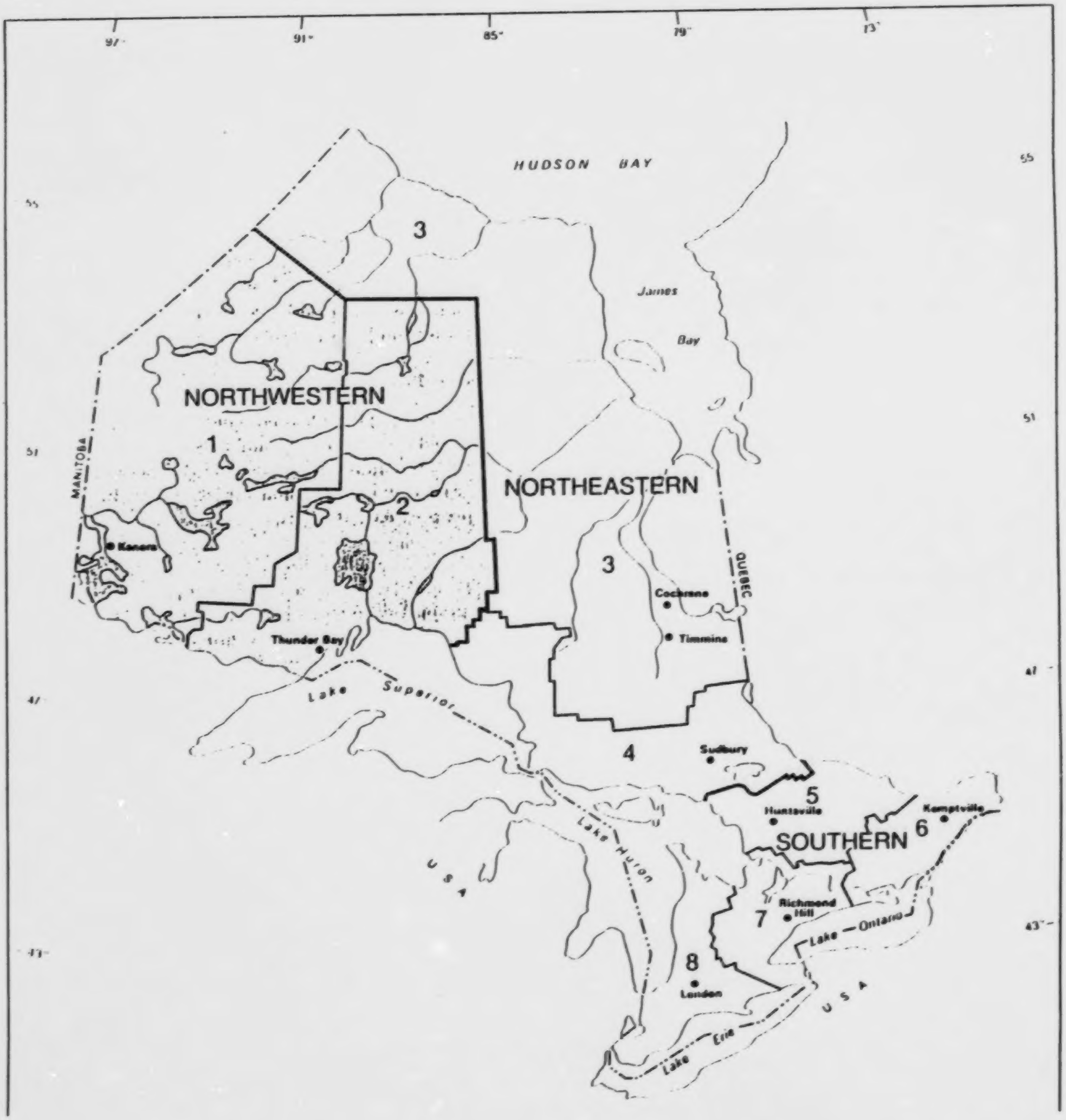

97°
91°
85°
79°
73°
55
55
51
51
47
47
43
43°
HUDSON BAY
3
James Bay
NORTHWESTERN
1
MANITOBA
2
NORTHEASTERN
3
QUEBEC
Kenora
Thunder Bay
Cochrane
Timmins
Lake Superior
4
Sudbury
5
Huntsville
Kemptville
SOUTHERN
6
U S A
Lake Huron
7
Richmond Hill
Lake Ontario
8
London
U S A
Lake Erie

Figure 3.10

Resource Management Planning in MNR's Corporate Framework
Ontario

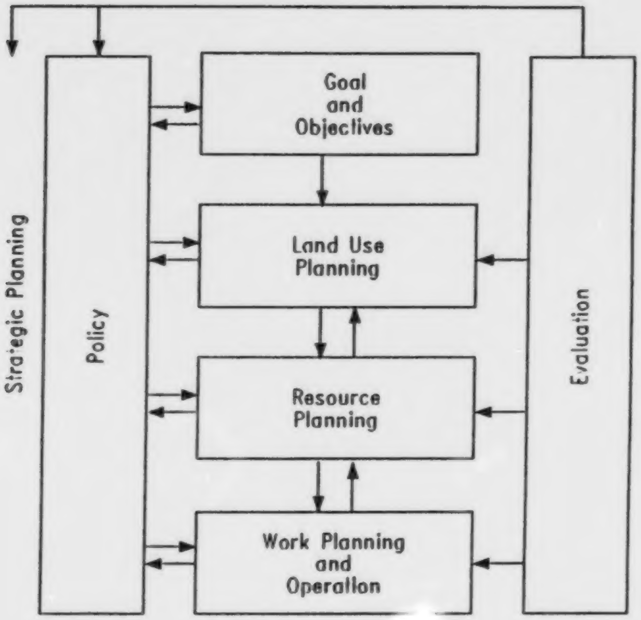
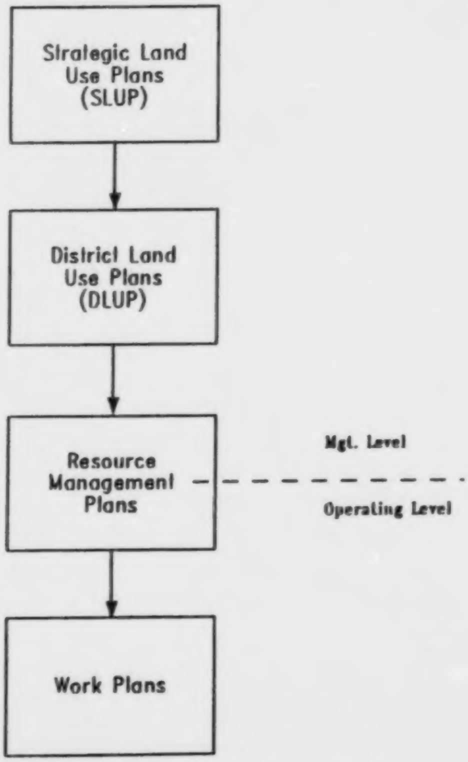

Strategic Planning
Policy
Goal and Objectives
Land Use Planning
Resource Planning
Work Planning and Operation
Evaluation

Figure 3.11

Planning Tools – Ontario


Strategic Land Use Plans (SLUP)
District Land Use Plans (DLUP)
Resource Management Plans
Mgt. Level
Operating Level
Work Plans

provide an overall strategy within which District Land Use Plans can operate. The purpose of a SLUP is to identify the policies and objectives of individual programs of MNR and integrate these into a comprehensive conceptual land use plan to identify and aid in resolving conflicting resource demands.

District Land Use Guidelines

The DLUGs specify targets for each MNR program at a district level. The guidelines are intended to give broad direction to land use management priorities and coordinate policies. The plans and directives within the guidelines have no statutory form or legal basis.

Resource Management Planning

Resource management planning is the link between land use planning and work planning within the MNR. The purpose is to translate objectives and targets from higher order plans to actions suitable for inclusion into the work planning system. Resource management planning results in specific statements of how resources, or combinations of resources, and technical knowledge are to be applied to achieve program objectives and targets.

Resource management planning is often divided into three further levels of planning:

Management Planning - sets detailed targets, policies and strategies required to meet the objectives and targets set out in the DLUG.

Operating Planning - specifies individual actions and projects to be carried out in priority of action.

Work Planning - In work planning, yearly plans are used to transpose targets to output measures.

3.3 NOVA SCOTIA

Less than 28% of the land base in Nova Scotia is Crown owned. The major portion of these lands is administered by the Department of Lands and Forests. Planning is undertaken by the department through the preparation of operational forest management plans for specific areas under its jurisdiction.

The Department of Lands and Forests is responsible for administration of the majority of Crown lands in the province. Other departments and agencies which are major land holders include: Government Services; Transportation; Mines and Energy; Nova Scotia Housing Corporation; and Nova Scotia Power Corporation.

A) LEGISLATIVE BASE

The Crown Lands Act S.N.S. 1987 c.5. is the governing legislation in Nova Scotia for land use planning.

B) JURISDICTION AND AUTHORITY

Figure 3.12 - Planning Framework for Nova Scotia. Source: Planning Authorities Environment Canada Working Paper 28 pg 89.

The Department of Lands and Forests is responsible for administration of the majority of Crown lands in the province according to the provisions of the Crown Lands Act. Planning on Crown lands is undertaken by the department through the preparation of operational forest management plans. Special areas on Crown lands may be set aside by the Minister for the maintenance of forests; forest research; protection of water flow; development of water power; protection of wildlife habitat; and other purposes the Minister deems expedient.

The Nova Scotia Land Use Policy Committee was established in 1976 to give advice to Cabinet on land use matters. The committee consists of the Deputy Ministers for the Departments of Agriculture and Marketing; Industry, Trade and Technology; Development; Environment; Fisheries; Health and Fitness; Lands and Forests; Mines and Energy; Municipal Affairs; Tourism and Culture; Transportation; and Small Business Development. The committee operates at three levels:

1. The Deputy Ministers
2. A permanent working group of Senior department officials
3. Department staff in issue groups as needed

The Crown Lands Act of 1987 was the result of a major policy review initiated by the Department of Lands and Forests. A primary goal of the program is to integrate wildlife, conservation and outdoor recreation considerations in the forest management planning process. The review was initiated after a Royal Commission on Forests which reported to the government in 1984. The process which followed included announcements of a Forest Policy in 1986, a Wildlife Policy in 1987 and a Parks Policy 1988. The policies were implemented by new or updated enabling legislation. In 1989, Forestry/Wildlife Guidelines and Standards, mandatory on Crown lands, were adopted by the province.

The Department of Municipal Affairs has the primary planning responsibility for urban and rural municipalities and regions through the Planning Act S.N.S. 1969 c.16. The Act provides for a Municipal Board to hear appeals involving zoning and development permits. District Planning Commissions may be established by Ministerial order at the request of urban and rural municipalities within a county area. These joint planning bodies assist in the preparation of Regional Development Plans.

C) PLANNING PROCESS

Figures 3.13 and 3.14 - Municipal Development Plan and Zoning Bylaws Processes, Environment Canada Working Paper 28, pg84.

Planning on the majority of Crown lands in Nova Scotia is the responsibility of the Department of Lands and Forests. The department undertakes a forest management planning process to guide decision making. The process involves the prediction of the effects of various forest management alternatives on wood supply. Wildlife requirements, ecological impacts and outdoor recreation opportunities, in addition to forest management practices, are considered in the process.

The process for the approval of Municipal Development Plans and Zoning Bylaws is overseen by the Department of Municipal Affairs, subject to review and approval by the Minister. These processes are outlined in Figures 3.13 and 3.14.

Figure 3.12 Planning Framework for Nova Scotia

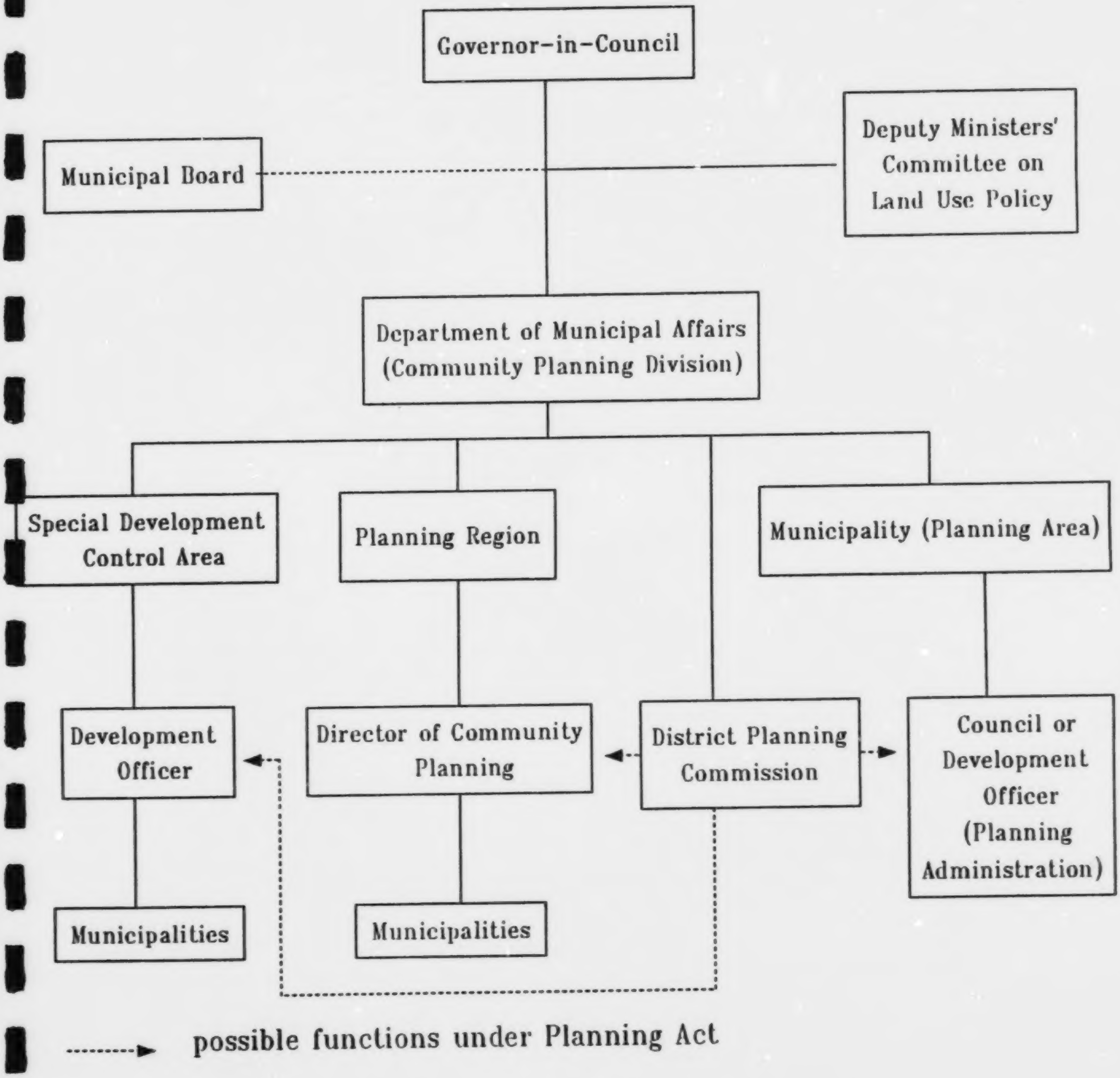
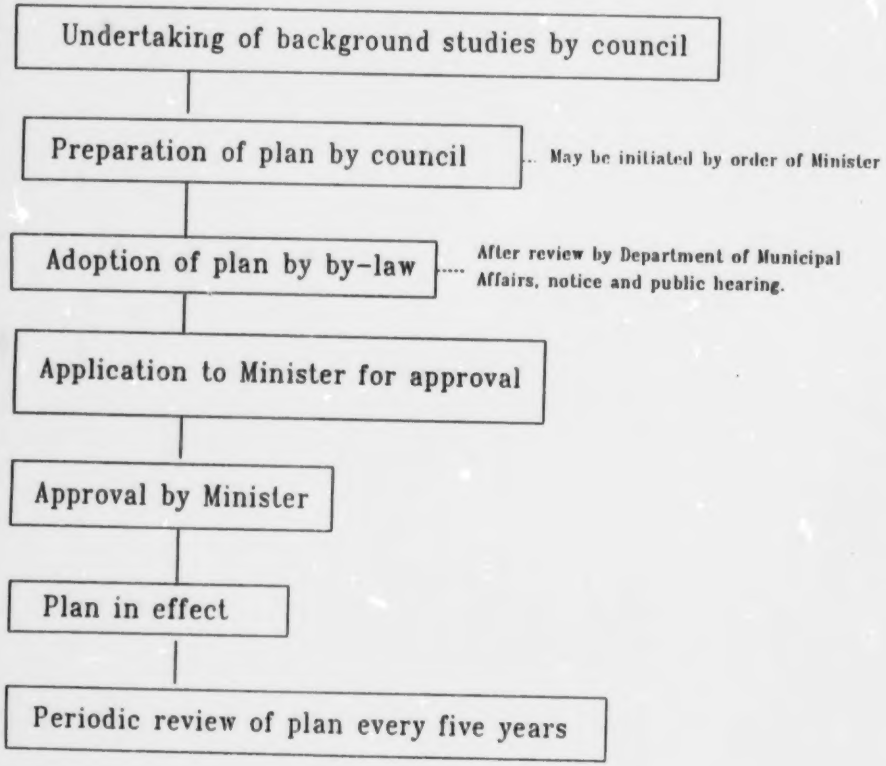

Governor-in-Council
Municipal Board
Deputy Ministers' Committee on Land Use Policy
Department of Municipal Affairs (Community Planning Division)
Special Development Control Area
Planning Region
Municipality (Planning Area)
Development Officer
Director of Community Planning
District Planning Commission
Council or Development Officer (Planning Administration)
Municipalities
Municipalities
possible functions under Planning Act

Figure 3.13

Municipal Development Plan Adoption and Approval Process

In Nova Scotia

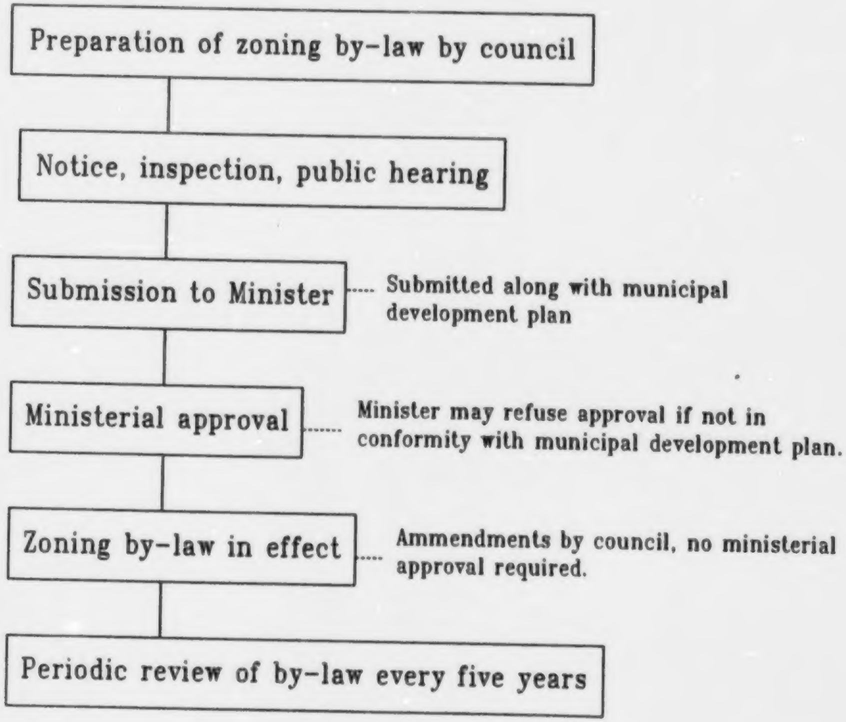


Undertaking of background studies by council
Preparation of plan by council
May be initiated by order of Minister
Adoption of plan by by-law
After review by Department of Municipal Affairs, notice and public hearing.
Application to Minister for approval
Approval by Minister
Plan in effect
Periodic review of plan every five years

Figure 3.14

Process Governing Adoption and Approval of Zoning By-laws

In Nova Scotia



Preparation of zoning by-law by council
Notice, inspection, public hearing
Submission to Minister
Submitted along with municipal development plan
Ministerial approval
Minister may refuse approval if not in conformity with municipal development plan.
Zoning by-law in effect
Ammendments by council, no ministerial approval required.
Periodic review of by-law every five years

Environmental impact assessment

The Nova Scotia Minister of the Environment derives the authority to require an environmental impact assessment for projects from the Environmental Protection Act S.N.S. 1977 and the Water Act S.N.S. 1973. Procedures for impact assessments are derived from the Environmental Assessment Act S.N.S. 1988.

A proponent is a private partnership or corporation, municipality, or provincial department, agency or Crown corporation proposing a project which may have an adverse environmental impact. The Environmental Assessment Division of the Nova Scotia Department of the Environment is responsible for screening projects, advising the Minister of Environment on projects having significant impact, coordinating EIA reviews and preparing recommendations on project approval to the Minister.

The Environmental Control Council (ECC) may hold public meetings and comment on an EIA on request of the Minister of the Environment. The ECC is composed of 12 to 15 members, representing specified professions or interests, appointed by Cabinet from outside the Nova Scotia public service. The ECC is authorized to take evidence under oath and to summon witnesses. On the basis of the recommendations received from the Department of the Environment, the Environmental Control Council (if requested) and Cabinet discussion, the Minister of the Environment decides whether a project may proceed and what conditions are required for acceptance of the project.

D) PLANNING PRODUCTS

Operational forest management plans prepared by the Department of Lands and Forests are a major component of the planning process for Crown lands in the province. Procedures for the planning process are not laid out in the Crown Lands Act but rather under departmental Forestry Policies.

Guidelines for potentially conflicting resource uses are determined following policy commitments of the Department of Lands and Forests. Forest/Wildlife Guidelines and Standards distributed in 1989, for example, were developed in consultation with staff of the Department of Lands and Forests, the Forest Advisory Council, the Wildlife Advisory Council and forest users. The guidelines are mandatory on Crown lands and incorporated into forest management programs for private lands.

3.4 NORTHWEST TERRITORIES

The Federal Department of Indian Affairs and Northern Development (DIAND) is the land manager for over 90% of the Northwest Territories (N.W.T). Management by DIAND is through a system of land use permits, licences and leases. While other agencies such as the Department of Fisheries and Oceans, the Department of Transport, the Canada Oil and Gas Lands Administration and the National Energy Board have interests in the N.W.T., DIAND retains decision-making authority on most issues.

A) LEGISLATIVE BASE

The Northern Land Use Basis of Agreement (1983) between the Federal and Territorial governments and native peoples forms the basis for land use planning. The Basis of Agreement provides for parity of representation on planning bodies for native peoples and northern residents. Agreement allows for the creation of regional committees to prepare land use plans with little interference from territorial or federal governments (see Figure 3.15).

Although most planning activities are undertaken by the Regional Commission, ultimate authority remains with the Federal Minister of IAND and the Northwest Territories Minister of Renewable Resources. Because Federal Cabinet and Government of the Northwest Territories (GNWT) Executive Council commitments and approvals are a required part of this signing process, the Regional Plan will have the official status and strength of Federal Cabinet policy and Territorial Executive Council policy.

B) JURISDICTION AND AUTHORITY

The GNWT also has certain responsibilities for land use planning and the transfer of others is currently under negotiation. The GNWT also has its own policies on resource development and other matters affecting land management.

Native organizations are the other major planning authority. Negotiations over aboriginal land claims have led to one settlement, which gives the Inuvialuit of the western Arctic title to substantial tracts of land as well as important rights with regard to land, resources and environmental protection. Agreements in Principle have been signed with the other two native federations, the Dene/Metis of the Mackenzie Valley in September 1988, and the Tungavik Federation of Nunavat (TFN) in January 1990.

The federal Cabinet approved a Northern Land Use Policy in 1981. The initial policy proposed a centralized system of decision-making offering only a minor role to the territorial government and the aboriginal peoples. In the N.W.T., this scheme was greatly modified in subsequent negotiations. In 1983, DIAND accepted a land use planning system built around a territorial Land Use Planning Commission comprised of a nominee from each of the aboriginal organizations, and two federal and two territorial government nominees. The 1983 agreement also contains several provisions intended to ensure that land use planning will be carried out with the full participation of northerners, specifically native northerners, and give priority to their interests.

The N.W.T. Land Use Planning Commission, based in Yellowknife, has now been abolished in favour of three regional commissions based upon land claim areas. Regional commissions are appointed by the federal Minister of Indian Affairs and Northern Development (IAND) in conjunction with the Northwest Territories Minister of Renewable Resources. Nominees typically represent a broad range of interests in the region, including communities, industry and public organizations. Due to the wording of the Northern Land Use Basis of Agreement, Regional Commissions apparently have much leeway in their planning activities i.e., ability to determine the composition of the commission; regional rather than centralized preparation of the regional plan; and wide latitude in the development of detailed terms of reference for planning goals and objectives. The desire is to divide the N.W.T. into 3 regions (based on land claims) with plan development undertaken and implemented regionally.
Presently only the Lancaster Sound Regional Plan has been prepared. It has been approved by the GNWT and is awaiting final Cabinet approval.

C) PLANNING PROCESS

The Northern Land Use Basis of Agreement defines the planning process for land use planning in the Northwest Territories (see Figure 3.16). The planning process

Figure 3.15

Planning Authorities – Northwest Territories

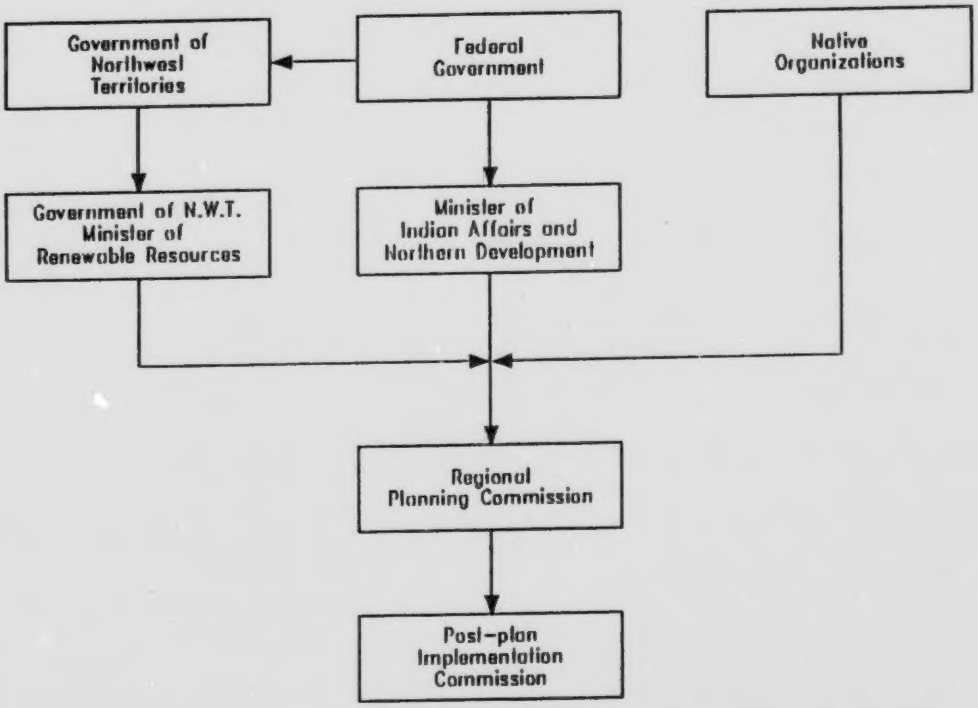
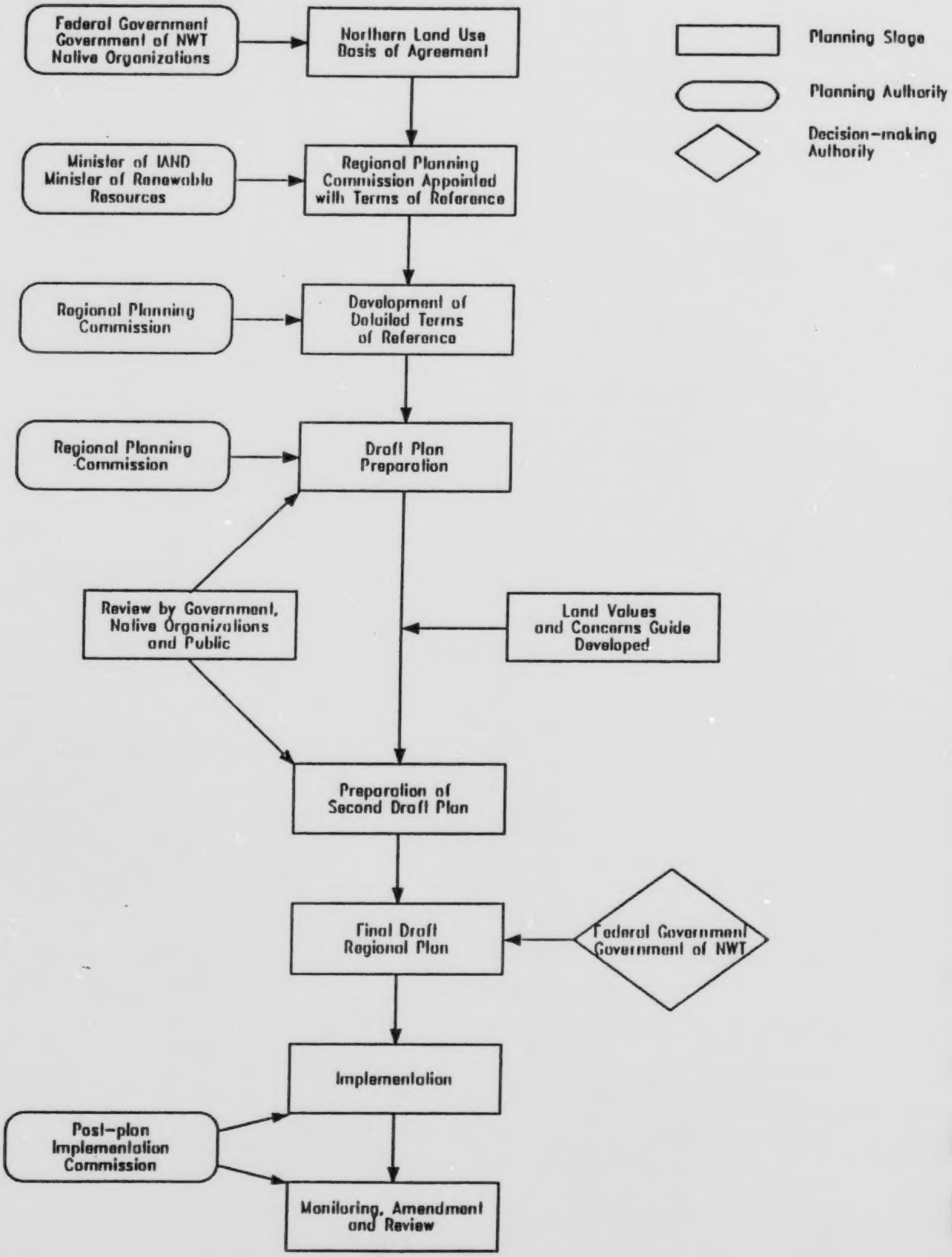

Government of Northwest Territories
Federal Government
Native Organizations
Government of N.W.T. Minister of Renewable Resources
Minister of Indian Affairs and Northern Development
Regional Planning Commission
Post-plan Implementation Commission

Figure 3.16

Planning Process – Northwest Territories


Federal Government
Government of NWT
Native Organizations
Northern Land Use Basis of Agreement
Planning Stage
Planning Authority
Decision-making Authority
Minister of IAND
Minister of Renewable Resources
Regional Planning Commission Appointed with Terms of Reference
Regional Planning Commission
Development of Detailed Terms of Reference
Regional Planning Commission
Draft Plan Preparation
Review by Government, Native Organizations and Public
Land Values and Concerns Guide Developed
Preparation of Second Draft Plan
Final Draft Regional Plan
Federal Government
Government of NWT
Implementation
Post-plan Implementation Commission
Monitoring, Amendment and Review

described in the following paragraph describes the process undertaken in the development of the Lancaster Sound Regional Plan.

Under the Basis of Agreement, a Regional Planning Commission is appointed and given broad terms of reference by the Ministers of IAND and GNWT Renewable Resources. The Regional Commission will then consult with communities to determine the boundaries and issues to be considered by the regional plan, and the most suitable way to involve the communities in the planning process. Detailed terms of reference, drafted by the Regional Commission are distributed to industry, governments, communities and other interest groups for their comment.

Upon acceptance of suitable Terms of Reference, workshops are held by the Regional Planning Commission with communities, industry, government and other interest groups to identify land use issues, constraints, opportunities, and possible solutions to identified issues. Through this process, the Regional Commission identifies preferred land use planning options. Additional workshops are held with interested parties to aid in the resolution of any planning conflicts. Preferred planning options are refined and discussed with industry, government, communities and other interest groups.

After multilateral discussion of planning options, a draft plan is prepared for submission to the Ministers of IAND and GNWT Renewable Resources. The Regional Commission will also recommend to the Ministers additional actions still required i.e., resolution of conflicts, review of the draft plan, and revisions required for preparation of the final land use plan. After Ministerial review, deficiencies within the plan are addressed. Workshops are also held to prepare a guide to Land Values and Concerns. This involves the identification by each community of the land areas of particular sensitivity such as wildlife travel routes and habitat, and archaeological sites.

A second draft plan is prepared and reviewed by government, industry, communities and interest groups. Based on review comments, the Final Draft Plan is prepared for Federal and Territorial Government approval. The entire process leading up to final approval must be completed within two years time.

Upon approval, the Regional Plan will be implemented. Implementation demands the integration of plan policies with existing processes of land use decision-making and resource management undertaken by government departments and agencies, and industry. Community implementation is to involve increased awareness and understanding of land use activities and their activities. Monitoring, amendment and review are to be undertaken to ensure that the plan is being implemented and that the objectives of the plan are being met. All aspects of implementation will be administered by the creation of a Nunavut Planning Commission, allowing for the abolishment of the Regional Planning Commission. This Commission will also be responsible for the annual review of the status of the regional plan, as well as on-going monitoring, implementation, amendment and review. No more than five years will elapse before the plan is reviewed in its entirety by the Planning Commission to ensure that the plan reflects changing demands within the region.

Environmental Impact Assessment

Environmental Impact Assessment on Crown Lands is carried out through the licensing and permitting system of DIAND. Small projects are reviewed and licensed through the Lands Division and the Land Advisory Committee. If impacts are thought to be large or of a regional nature, the Regional Environmental Review Committee (RERC) carries out a review of the project and determines the terms and conditions for licensing.

The RERC is co-chaired by DIAND and the GNWT Renewable Resources and includes members from both Federal and Territorial governments dealing with land and water use. The RERC can recommend that the project be assessed through the Environmental Assessment and Review Process administered by the Federal Environmental Assessment and Review Office.

On Territorial Lands, the Commissioner's Land Environmental Review Committee screens all projects for environmental impacts. This committee is made up of members from the Territorial government only.

Impact Assessment on Inuvialuit land is carried out through a two stage process. All projects are screened for potential impacts by the Environmental Impact Screening Committee (EISC). If a project is deemed by EISC to have significant impacts, the Environmental Impact Review Board (EIRB) will conduct a review of the project and determine the conditions and terms for it to proceed. EIRB may also recommend that a project not continue.

The planning process in the NWT, although founded on the same authority as that of the Yukon, has been more regionalized and further devolved to regional boards.

D) PLANNING PRODUCT

A Regional Land Use Plan is one of the products of this plan. The intent of the plan is to provide general policy directions for land use, to identify areas of jurisdictional overlap between and within governments and to suggest improved methods for decision-making by those engaged in land use activities i.e., government, industry and communities. Site specific information about Land Values and Concerns will assist in decision-making and the regulation of specific land use activities. The Land Use Plan attempts to integrate the threads of economic development, land use and conservation into a single fabric. This represents a dramatic change from traditional land use planning.

3.5 NEW ZEALAND

Approximately one third of New Zealand's land mass and virtually all of its coastline is under the management of the Department of Conservation (DOC). This includes all native bush and protected areas not privately owned. This accounts for approximately two thirds of the crown land in New Zealand. The remaining third (about 17% of the land mass) is accorded to the state owned corporations. All requests for crown land lease or purchase must go through the DOC

New Zealand is organized into 13 regions subdivided into 79 districts called territories. The regions are delineated by water catchments while the districts are separated into cities and district or territorial councils (combination of towns and rural areas).

A) LEGISLATIVE BASE

New Zealand's resource and environmental administration was radically transformed in 1984. Three major acts established the new agencies and organizations: The Conservation Act 1987, the Environment Act 1986, and the State Owned Enterprises Act 1987. Through them, the Ministry for the Environment (MFE) was established and mandated to ensure: a) full accounting of intrinsic values of ecosystems, b) recognition of values applied by individuals and groups on the quality of the environment were recognized, and c) the sustainability of natural and physical resources.

B) JURISDICTION AND AUTHORITY

Under the massive revision of the mid 1980s, all government agencies were pared to become single purpose institutions, state owned corporations or specific commissions. The central agency is the Ministry for the Environment (MFE), a policy formulating and decision making body. It is mandated to ensure the legitimate integration of resources and native and environmental concerns embodied in a concept of sustainable development. A conscious separation of development and conservation resulted in the various state owned corporations and the Dept. of Conservation. Quasi-autonomous Non-government Organizations (QUANGOS) were given the responsibility of environmental monitoring and research. They, along with public interest groups, contributed input to the decision making process (See Figures 3.17 and 3.18).

MFE acts as a neutral, decision making and policy formulation agency through which all other government agencies must pass if they wish to incorporate new legislation. A Resource Management Bill, presently before parliament, will redefine many of the laws and regulations regarding resource allocation and management.

The central government has clearly defined functions which include national policy statements, national power to deal with issues of national significance, minimum standards and guidelines (including hazardous wastes), water conservation and heritage site orders, and mineral allocation. All policies implemented must be monitored.

Each region has directly elected authorities who are responsible for resource allocation and management and policy coordination with other local government functions. Territorial councils are elected in a ward system to ensure proper representation from each subsection of the territory. All territorial authorities have under them subunits known as community boards composed of elected representatives and territorial level ward representatives. This board is given the responsibility of day to day resource management decisions in that territory.

Local government authorities are required to present a corporate plan to the public each year which must include where the money for programs will come from, where it will be spent, how they plan to measure the success of the programs instituted, and how they did in the previous year with their programs. All new regulations and ordinances must be part of the plan.

Environmental Impact Assessment

Though not explicitly called "Environmental Impact Assessment", the Dept. of Conservation (DOC) is mandated to preserve and protect natural and historic resources and safeguard the options of future generations. It has management responsibilities over crown lands and is mandated to promote conservation both on and off these lands.

Though the DOC wished to have an assessment process which was to be implemented well before the consent and planning process, it now appears that environmental assessments will be incorporated into the planning process.

No matter which approach is to be used, the idea is that a legal framework be established which is environmentally neutral in that resources are viewed in terms of their development, conservation, and protection.

Figure 3.17

Planning Tools in New Zealand

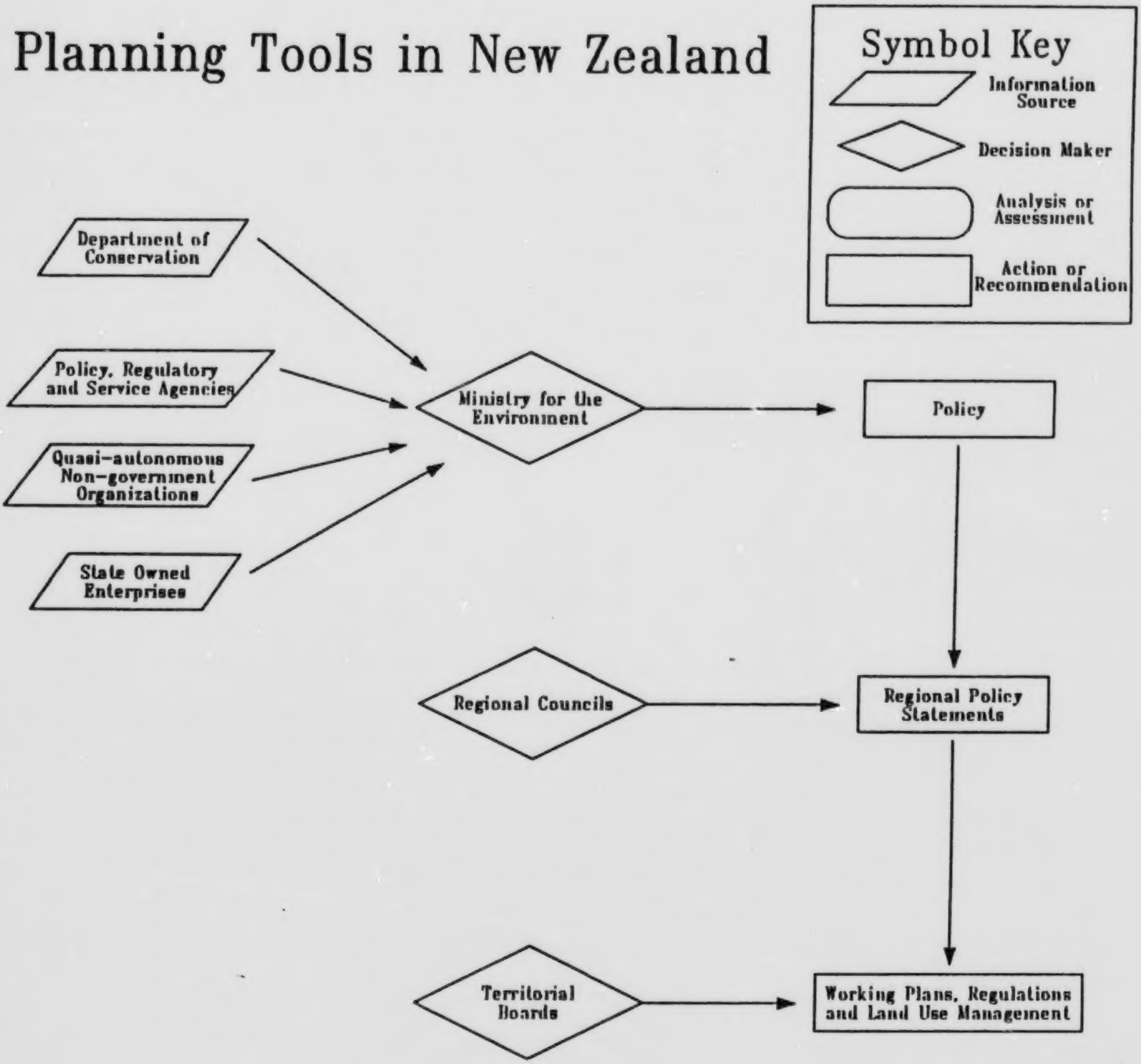
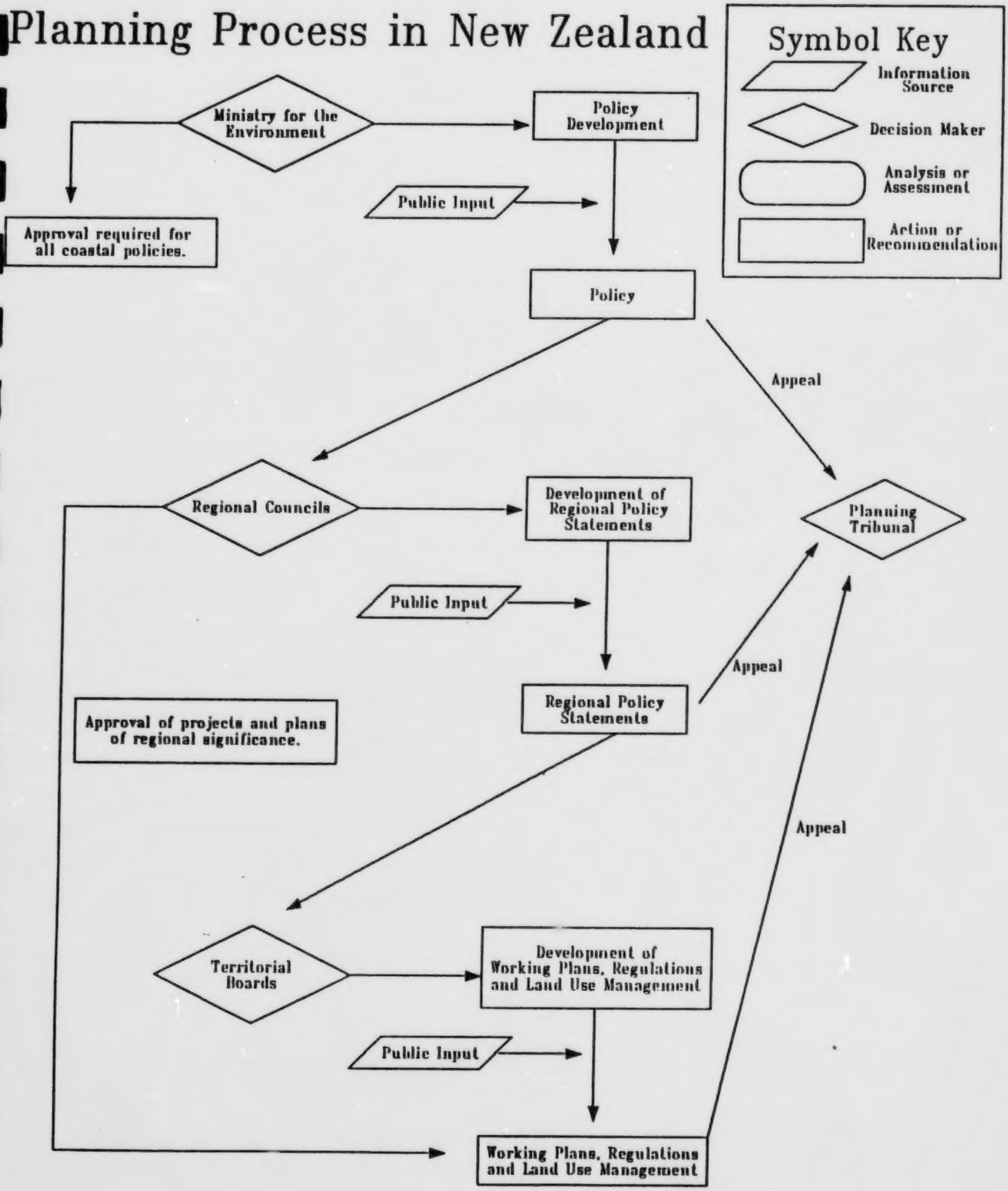

Symbol Key
Information Source
Decision Maker
Analysis or Assessment
Action or Recommendation
Department of Conservation
Policy, Regulatory and Service Agencies
Quasi-autonomous Non-government Organizations
State Owned Enterprises
Ministry for the Environment
Policy
Regional Councils
Regional Policy Statements
Territorial Boards
Working Plans, Regulations and Land Use Management

Figure 3.18

Planning Process in New Zealand


Symbol Key
Information Source
Decision Maker
Analysis or Assessment
Action or Recommendation
Ministry for the Environment
Policy Development
Public Input
Approval required for all coastal policies.
Policy
Appeal
Regional Councils
Development of Regional Policy Statements
Public Input
Planning Tribunal
Appeal
Regional Policy Statements
Approval of projects and plans of regional significance.
Appeal
Territorial Boards
Development of Working Plans, Regulations and Land Use Management
Public Input
Working Plans, Regulations and Land Use Management

A workable framework rather than a set of priorities is established when dealing with resource allocation. One important condition included in the development of any project is the requirement for appropriate monitoring at all levels to ensure feedback on the implementation of the project. Cumulative effects are to be included in the assessment.

C) PLANNING PROCESS

The driving feature behind all processes and plans to be inaugurated must be "to provide the sustainable management of natural and physical resources" (Resource Management Bill). Sustainable development will be defined at the regional scale.

Plans are developed regionally following the guidelines established by the central government. All regional plans are open to public scrutiny, submission, and appeal to the Planning Tribunal before being made operative. For any project involving more than one authority, joint hearings will be mandatory.

Extensive public participation was initiated during the process of reorganization. Information was presented, public meetings were held, written and oral proposals were received and free phone lines to call and inquire of government officials were put in place. The process allowed for consensus building and developed increased awareness of issues and alternatives. This notion of complete public participation is fundamental to the legislation presently before parliament.

All regional level plans have open rights of participation and appeal and are available to any person and any agency. Appeals are made through the Planning Tribunal. This tribunal is an environmental court consisting of a number of judges. An open standing policy has caused some concern in that delays in project development can occur simply by having a competitor appeal a decision.

Enforcement procedures are well entrenched in the new legislation. Enforcement will be able to be undertaken by any person or authority having responsibility for particular functions. Local authorities can give abatement notices which carry the force of law. Company officers will be personally liable and can be prosecuted for offences they knew or ought to have known about.

Any central government legislation or policies planned are brought to the central agency (MFE) and dispersed for review to those affected or interested. Responses are accumulated and assessed, and a final decision, outlined by an explicit process, is made.

Public interest groups and Quasi-Autonomous Non-government Organizations (QUANGOS) monitor government performance and have an appeal function allowing for public involvement and access to the decision making process and policy formulation. The Parliamentary Commissioner acts as an ombudsman for the environment and is responsible to parliament, not to cabinet. Commissioners have the power to intervene in development planning and licensing procedures and can proceed on any issue if they feel that environmental concerns have not been adequately addressed.

D) PLANNING PRODUCTS

The MFE is responsible for an overall set of policies and processes which are used as guidelines to develop plans. Delineated communities can establish their own sets of priorities with reference to resource and land allocation using these established policies and guidelines.

A new 459 clause Resource Management Bill, introduced into parliament in December of 1989, is principally enabling and will be implemented by local governments.

At the regional and district level, there will be two types of plans:

1) Regional Policy Statements, a mandatory, comprehensive document on all aspects of environmental, land use and resource management in the region.

2) Operational Management Plans, having the force of law, will be detailed plans addressing specific resource management issues or areas.

3.6 STATE OF WASHINGTON

The State of Washington administers approximately 5.2 million acres(7.1 million hectares) of public trust lands. These lands were either granted to the people of Washington upon Statehood in 1889, or were purchased, acquired or given to the State over time. Of this total, 2.1 million acres (0.85 million ha) are dedicated to forestry, 1.1 million (0.45 million ha)to agriculture and grazing, and another 2 million are aquatic.

A) LEGISLATIVE BASE

Resource planning and management is directed by the State Legislature through enabling legislation. Major pieces of legislation include:

The Enabling Act: This Act endows trust lands to the State of Washington and puts limits on the sale and management of these trust lands.

The Multiple Use Act (MUA): This Act directs the Department of Natural Resources (DNR) to apply the concept of multiple resource use to management activities. Resources are also to be managed on a sustained yield basis (RCW 79.68.03).

The Forest Practices Act (FPA): This Act regulates all forest activities on state and private lands in the State of Washington.

The State Environmental Policy Act (SEPA): SEPA requires that all applicable state policies, regulations and laws be administered with specific concern for the protection of the environment. This Act parallels the national NEPA Act requiring an environmental assessment of all state activities which may have significant environmental impacts.

B) JURISDICTION AND AUTHORITY

For the purposes of management, Washington State is divided into seven administrative areas which are further subdivided into districts and units. Most planning is undertaken at the block level.

DNR is responsible for the management of all trust lands including agricultural and grazing, transitional lands and forestry lands. Land use planning is completed on the basis of activity taking place upon the land; no comprehensive planning covering an entire administrative area exists. Instead, a separate policy plan exists for the management of agricultural, transitional and forestry lands. Planning is undertaken by the relevant division of DNR. In all instances, the maximization of resource revenues appears to be the overriding goal of management.

The Commissioner of Public Lands, an elected official, directs the activities of DNR. The Board of Natural Resources, made up of six members including the Commissioner, sets and adopts goals, objectives and policies for DNR. Area Managers are ultimately responsible for the majority of planning activities. District Managers assist in planning, while daily operational decisions are made by Local Managers at the unit level.

C) PLANNING PROCESS

The planning process for state owned forest lands will be described in detail since it is seen to have the greatest impact on the management of public state lands. The management program for agricultural and transitional lands are also described, but no specific planning process exists with these programs.

Forest Land

Prior to 1978, planning and management of forested lands was essentially ad hoc. In 1979 a Forest Land Management Program (FLMP) was prepared to guide forest management. Court challenges found the FLMP inadequate. This led to the development of a new FLMP in 1984. Forest land planning is now a legislated requirement of FLMP. Other provisions of FLMP include financial planning, heritage protection, forest protection, forest production and timber harvest. FLMP is an umbrella document under which state forest land planning is completed.

FLMP was prepared internally by DNR teams comprising a number of disciplines to direct forest management activities on all State lands up to 1993. Since full implementation of FLMP has occurred only recently, the process described in following paragraphs must be viewed as very new and largely untested.

A Strategic Plan for Forest Resource Management was also prepared in 1988 to guide the management of trust lands for the people of Washington today and in the future. The plan set out preferred visions, a mission statement and gathered information to develop long term goals and objectives and the strategies and policies to achieve them.

The Block/Drainage Management Plan (BDMP) is the basic planning tool prescribed by FLMP for forest land planning. A BDMP is a forest management plan for a large contiguous forest area which has common identifiable issues or concerns. Sub-planning areas which may display divergent resource issues may also be combined into a block management area. A BDMP allows for the integration of FLMP provisions to operational management activities. BDMPs do not duplicate FLMP provisions but supplement the guidelines and policies found within FLMP.

Since DNR does not have the resources to complete BDMP for all State lands, they are developed on a priority basis. Priority is defined by two conditions: a sufficient concentration of lands to warrant a plan; and sufficient issues involved in management to warrant the plan. Issues usually evolve around competing usage, most often recreation versus timber harvesting. Therefore areas with BDMP are usually found in close proximity to urban areas. Areas not under BDMP are managed in accordance with policies and guidelines established by FLMP.

The development process for block/drainage plans is designed to be flexible and adaptive to local conditions. Therefore, planning activities and their timing may differ during the development of individual plans. This is desirable. Any block planning process, however, will have these common features: a detailed description of goals and objectives; definition of land use alternatives; a recommended planning alternative; and a method to implement the planning alternative when adopted. Operational plans are then developed to carry out specific resource actions ie., timber sale planning or recreational site plans. BDMPs differ from operational plans in that they show existing and future land uses, but do not detail prescriptive activities to achieve these uses.

In the block/drainage planning process, blocks are initially identified and are scoped internally at the area level for issues. Watersheds within blocks are also defined in recognition that they may have management issues different from the block as a whole. District and local managers identify issues and prepare a planning strategy for the block detailing planning teams, costs, constraints, opportunities and issues. This is reviewed by the Area Manager prior to review by the Board of Natural Resources. Based on the information supplied for a block, the Board of Natural Resources provides feedback and authorizes planning to proceed. Important issues noted by the Board of Natural Resources are required to be incorporated into the planning process.

Upon authorization, the interdisciplinary planning team is established to prepare the BDMP and to provide liaison with the Board of Natural Resources and other relevant divisions of DNR. Other agencies or interests are included in the planning process as required. External scoping is undertaken to define other issues or concerns from adjacent landowners, interest groups, tribes, the general public and other agencies. The nature of this scoping process is to be developed by the planning team and may range from formal to informal. The spatial extent of the scoping process is also left to the discretion of the planning team. Specific planning issues are defined through the consolidation of scoping information. Based on internal and external scoping of issues, the final boundaries for the planning area are established. This helps the planning team delineate the sphere of influence of DNR's management plan in relation to adjacent properties.

Upon boundary identification, the planning team is entrusted to identify the goals and objectives for the planning block. Goals and objectives must reflect the needs of the planning block based on the defined policies of FLMP (which include non-timber uses), block-specific issues and concerns, and public input. Therefore, each planning block should have a unique set of goals and objectives for planning based on local needs and issues.

In conjunction with other agencies, as applicable, the planning team completes a formal inventory of resources and their relationships within the planning block. The results of this inventory will be displayed on maps displaying resource relationships, physical and cultural features and topography. Legal and administrative constraints on planning are also to be identified.

This process allows the planning team to construct a plan which identifies and evaluates a number of plan alternatives. Plan alternatives are to be developed based on: spatial delineation of resources and physical and cultural features; quantitative analyses of the distribution and quality of resources such as soils, forest cover, and hydrography; the ten year harvest schedule and the proposed road network; integration of an overall riparian zone management plan denoting specific fish and wildlife habitat goals and objectives for specific aquatic areas; integration of a public use plan displaying capabilities for recreation use; and integration of other issues and concerns along with the goals and objectives established for the planning area previously.

The Area Manager is responsible for the selection of a planning alternative. Based on this selection, a draft BDMP is prepared by the planning team which incorporates all the information collected, and goals and objectives for the block. Divisions within DNR have the chance to review the plan within a specific period of time. The Area Manager and the Board of Natural Resources give approval for public review of the draft plan.

Public review allows for input before final adoption of the plan. Draft copies are sent to all interested agencies and groups who aided in the development of the plan. Responses are summarized and incorporated into the plan. The Area Manager presents the final plan for Board of Natural Resources review and approval. Upon adoption the final BDMP will provide resource management guidelines to assist resource utilization within the planning area.

To date 47 blocks requiring planning have been identified, but only two BDMP have been developed. The time required to develop BDMP is expected to be one to eighteen months with review expected every ten years. Since no plans have undergone review the nature of the review process is largely unknown.

Although there is no mechanism to appeal the development of a BDMP, decisions made on the basis of the BDMP may be appealed. An administrative appeal can be made to the Commissioner of DNR followed by an appeal to the Board of Natural Resources. Litigation is available if the result is still deemed unsatisfactory.

Public Involvement

Although public participation within the planning process is discretionary, DNR recognizes public participation must occur to legitimize the planning process. The emphasis of public participation is consultation on planning activities. A public advisory committee may be set up where conditions warrant, but mandatory use of this type of committee is felt to hinder planning in most instances. Other important opportunities for public participation also exist through the mandatory completion of an environmental assessment for all plans.

Environmental Impact Assessment

SEPA requires a full environmental assessment be undertaken to evaluate all projects initiated by the state. Important opportunities for public involvement exist through this legislation. A comprehensive environmental impact assessment (EIA) was required during development of FLMP. It is not required that an additional EIA be completed for each BDMP. It is expected that an EIA will only be completed for a BDMP when planning and management issues are seen to deviate greatly from the norms found within the state.

Monitoring

A ten year action plan is developed which allows for the fulfillment of goals and objectives defined in the BDMP. An annual work program is also developed to reflect the action plan and denote activities for the near future within the block.

The State of Washington is in the process of developing a mandatory annual monitoring plan for BDMP to review the effectiveness of management activities.

At present there is no effective means of enforcing BDMP guidelines and regulations.

D) PLANNING PRODUCTS

State Level:

FLMP defines both specific activities and general guiding principles to be incorporated into planning and management activities undertaken on state owned lands by DNR.

Block/Drainage Level:

BDMPs display existing and future land uses for land within the planning area. Operational plans detail prescriptive activities to achieve these desired land uses.

Agricultural and Grazing Lands:

Management and planning of agricultural and grazing lands is directed by the Agricultural and Grazing Lands Program Policy Plan. This policy plan was developed over 2.5 years to set goals, objectives and policies for the management of these lands.

Agricultural issues were identified by DNR staff, state and local officials, and the public. Planning teams comprising DNR staff, state and local officials, faculty from Washington State University and representatives from the agricultural industry developed alternative policy proposals for each issue. Upon review of alternatives by the Commissioner of Public Lands and DNR staff, a draft policy plan was developed. The draft was reviewed through public meetings and written submissions. Utilizing this input a final Policy Plan was developed to guide the management of agricultural and grazing lands into the next century.

Transitional Lands

FLMP also allows for the management of Transitional Lands and for Strategic Planning. Underutilized or unmanageable for forestry uses, transitional lands are usually found at the urban fringe. Directed by the Transitional Lands Act (1984), the goal of management is to maximize revenues from these lands. A Transitional Lands Policy Plan was developed four years after FLMP. Issues were developed by the public, DNR staff, and government officials. DNR staff, academics and government officials developed alternative policies, and a draft policy plan was developed. After public review, revisions were made and the final Policy Plan was drafted.

Reference

State of Washington. Department of Natural Resources 1987. . Block Drainage Planning Guidelines, by Jerry Probst.

3.7 STATE OF OREGON

The Federal departments of the Bureau of Land Management and the United States Forest Service administer most of Oregon's public lands. The majority of the remainder is managed by the Oregon Department of Forestry. However, this amounts to only 4% of the State by area, or 835,000 acres of productive forest land.

A) LEGISLATIVE BASE

The present system for state-wide planning originates with State Bill 100. Enacted as the Oregon Land Use Act (1973), this Act required that all cities and county jurisdictions complete comprehensive plans based on 19 legally binding state-wide goals. Plans must include land use regulations based on state-wide standards for plans and a review process to ensure compliance.

The Oregon Forest Practices Act (FPA) directs the management of all timber activities within the State of Oregon. The Act clearly states that the Department of Forestry will regulate all forestry activity outside of urban growth boundaries. The FPA exists to ensure the continuous growing and harvesting of tree species while protecting public concerns.

The management of Common School Forest Land is provided for under Article VIII, section 5 of the State Constitution. Oregon Statute (ORS) 530.050 directs the State Forester, under the direction of the State Forestry Board, to manage the forests of Oregon for the greatest good of the people. ORS 526.16 allows for the creation of the Forest Program for Oregon by the State Forestry Board. ORS 526.255 and 526.265 require that long-range plans be completed for each of the State's four forest regions. Operational decisions are made at the regional, district or individual forest level.

B) JURISDICTION AND AUTHORITY

For planning purposes, the State's public land is divided into four forest regions. Public state lands are classified as either Common School Forest Land (CSL) or Board of Forestry Land (BOF). CSL lands are an educational trust for Oregon's children. Revenue generation from these lands is the primary goal of management with recreational, wildlife habitat and other environmental values being considered. BOF lands are also managed for the greatest good of Oregon's citizens, implying management for the maximization of timber revenues. Long-range timber plans for public state lands are prepared for each state forest region.

C) PLANNING PROCESS

A state-wide Planning Program developed by the Oregon Land Conservation and Development Commission (LCDC) mandates comprehensive planning for all public and private land based on 19 specific planning goals. Every city and county is required to complete a comprehensive land use plan consistent with these goals. The Department of Forestry prepares long term timber plans for public state lands designated for forestry uses by local planning agencies.

A number of boards and agencies exist to aid comprehensive and forest land planning in Oregon (see Figure 3.19):

- **Joint Legislative Committee on Land Use** (JLCLU): This committee consists of four speakers from the House of Representatives and three senators. Their task is to review aspects of the State-wide Planning Process and make recommendations on this process to the State Legislature.

- The **Land Conservation and Development Commission** (LCDC): Appointed by the governor, this seven-member committee is responsible for the development of state-wide policies for land use planning including planning goals.

Figure 3.19
Planning Authorities – State of Oregon

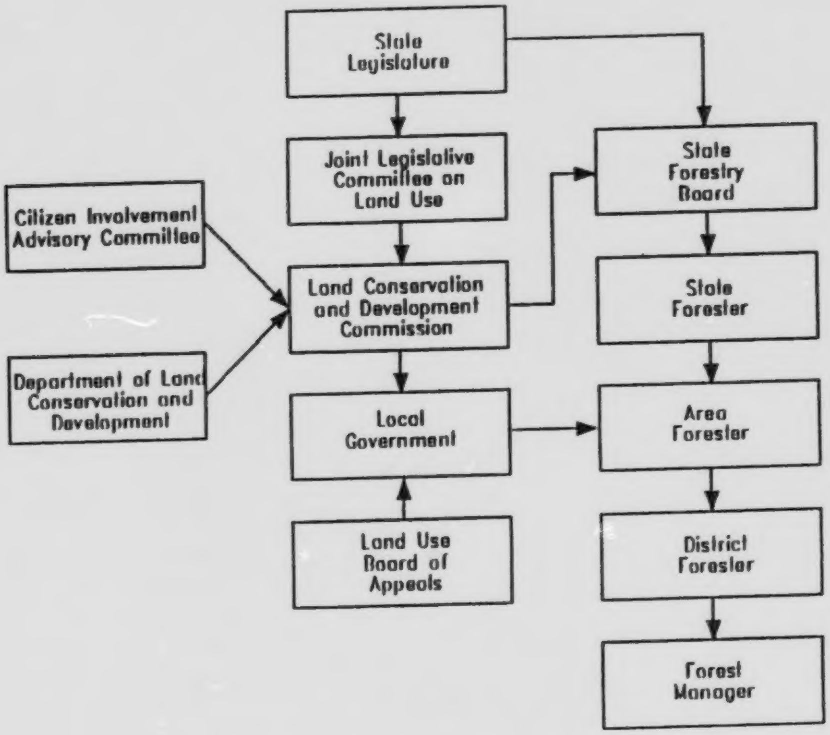
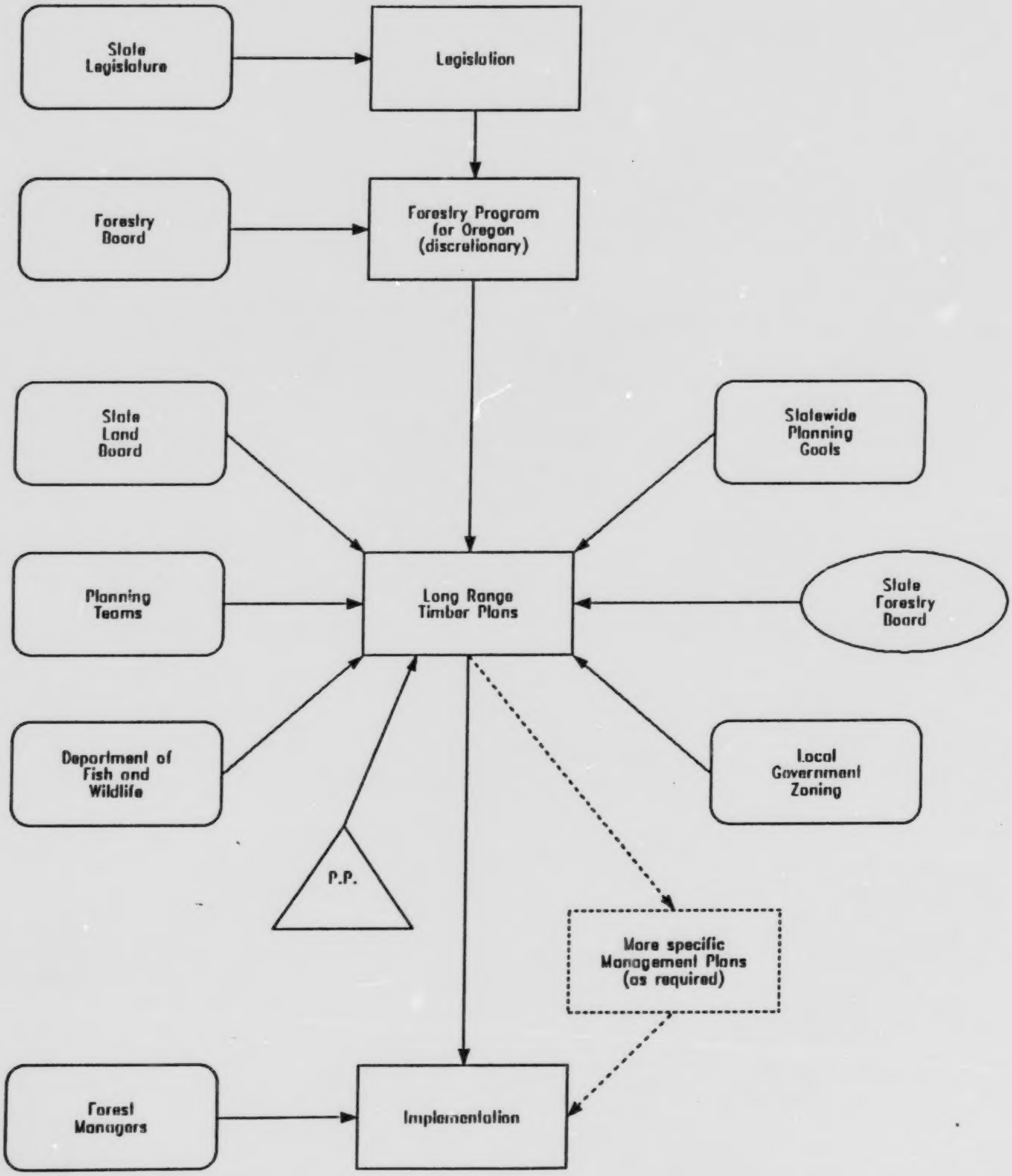

State Legislature
Joint Legislative Committee on Land Use
Citizen Involvement Advisory Committee
Land Conservation and Development Commission
Department of Land Conservation and Development
Local Government
Land Use Board of Appeals
State Forestry Board
State Forester
Area Forester
District Forester
Forest Manager

Figure 3.20 Forest Land Planning – State of Oregon


State Legislature
Legislation
Forestry Board
Forestry Program for Oregon (discretionary)
State Land Board
Statewide Planning Goals
Planning Teams
Long Range Timber Plans
State Forestry Board
Department of Fish and Wildlife
Local Government Zoning
P.P.
More specific Management Plans (as required)
Forest Managers
Implementation

- The **Department of Land Conservation and Development** (DLCD): This is the administrative arm of the LCDC. The DLCD provides technical support for the LCDC as required.

The **Land Use Board of Appeals** (LUBA): Is essentially a state court which rules on matters involving land use conflicts. LUBA consists of three lawyers with extensive knowledge of Oregon's land use procedures. They are appointed by the Governor. Powers have been usurped from the local courts and given to this board to streamline the appeals process. Their decisions have the force of law. Further actions can be taken to the State Supreme Court.

- **Citizen Involvement Advisory Committee** (CIAC): This eight-member committee, made of individuals from each of the state's major regions, makes recommendations to LCDC to ensure the adequacy of public participation in the planning process. Committee members are appointed by the Governor.

- **State Forestry Board**: This is a seven-member board appointed by the Governor to direct the management of state forest lands. No more than three members of the Board may derive a significant portion of their income from the forest products industry. At least one member must reside in each of the three major forest districts and the term of office is four years with no more than two consecutive terms to be filled by a single member. Statute allows the Forestry Board to prepare a Forest Program For Oregon (FPFO) which defines general forestry and specific planning policies for all forestry activities on private and public lands. The State Forester administers the FPFO as directed by the Forestry Board and the Forest Practices Act.

- **The State Land Board:** This board is responsible for CSL lands and must be consulted on all management issues concerning these lands.

The Forest Resources Planning Program Director and the Land Use Planning Coordinator ensure coordination between the Department of Forestry and local planning agencies.

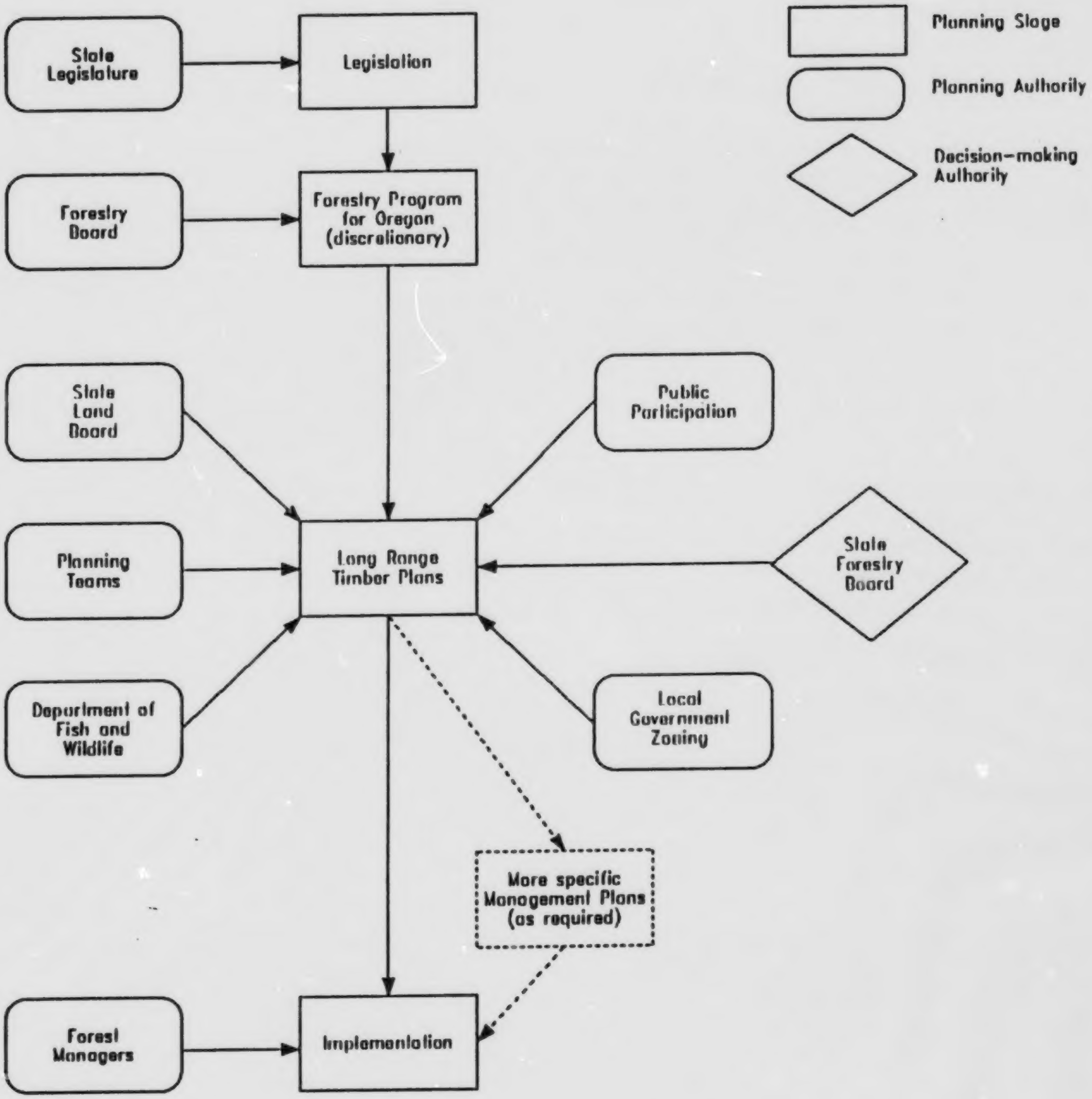
Since land use planning for state owned land is intricately related to the State-wide Planning Program, it is necessary to describe the state-wide program prior to discussion of forestry or public land planning in Oregon (see Figures 3.20 and 3.21).

State-wide Planning Program

Oregon's detailed State-wide Planning Goals give detailed instruction as to the direction and nature of comprehensive land use planning. Each local jurisdiction is required to submit a comprehensive plan, along with associated land use regulations, to the DLCD. DLCD reviews the plan and prepares recommendations for the LCDC. Other state agencies, interest groups and private citizens may also comment on the draft. All comments are reviewed by LCDC. Formal approval of the plan by LCDC constitutes "acknowledgement" of the plan. The plan then has the force of law. It is expected that the development of an initial comprehensive plan can take two to four years.

It is in the interests of the local jurisdiction to have plans acknowledged for two reasons. First, it is required by state law. Second, without acknowledgement, all land use decisions must be assessed individually against the state planning goals. Acknowledgement therefore, streamlines the land use decision process.

Figure 3.21
Public Land Planning Process – State of Oregon



Planning Stage
Planning Authority
Decision–making Authority
State Legislature
Legislation
Forestry Board
Forestry Program for Oregon (discretionary)
State Land Board
Public Participation
Planning Teams
Long Range Timber Plans
State Forestry Board
Department of Fish and Wildlife
Local Government Zoning
More specific Management Plans (as required)
Forest Managers
Implementation

An important part of Oregon's planning program is coordination. It is required that comprehensive plans be consistent not only with state goals, but with the provisions of adjacent jurisdictions local plans and state agency programs.

To ensure plans do not go out of compliance, a plan amendment process requires all plan amendments be submitted to DLCD prior to adoption. Every five to six years all comprehensive plans are formally reviewed. To remain current, the plan must be assessed against four criteria as outlined in ORS 197.640.3. Review is a process of continual amendment, rather than re-initiation of the entire planning process.

The review criteria are:

1: Substantive change in the circumstances upon which the original plan was developed. If change has occurred, the present plan may no longer be in compliance with state goals.

2: Present provisions of the plan are no longer in compliance due to amendment of state goals.

3: Inconsistency with a state agency program which did not exist at the time of acknowledgement. The state agency must prove that the existing local plan no longer fits their program.

4: The city or county has not completed some aspect of planning required by LCDC.

As mentioned, a specific appeals process exists through LUBA (see above).

Public Involvement (State-wide Planning)

The first State Goal outlines the need to ensure public input to the planning process. Citizens have the opportunity to comment on comprehensive plans prior to acknowledgement or amendment. Also the CIAC gives recommendations to LCDC to ensure adequate public input.

Monitoring (State-wide Planning)

Monitoring is generally not undertaken.

Environmental Impact Assessment (State-wide Planning)

There is no formal process for comprehensive environmental assessment. Rather Consequential Analysis is completed according to the provisions of State-wide Goal 5. This requires an assessment of social, environmental and economic implications of the proposed comprehensive plan. It is felt that since the development of comprehensive plans is completed with full public participation, environmental and other considerations should have been adequately accounted for making a full EIA redundant.

Comprehensive plans allow for the application of zoning regulations and ordinances to private and public land within the defined local planning area.

State Forestry Planning

The aim of Department of Forestry planning is to coordinate their planning activities with local planning agencies to ensure consistency in activities. Differences are discussed to overcome conflicts.

Local jurisdictions decide on the allocation of state BOF lands. Essentially, local government may either allocate this land to forestry or go against Goal 4 and allocate this land to another non-forestry use. Since by the provisions of the FPA only the Department of Forestry may undertake forest management, any other allocation will specifically prohibit any forest revenue generating activities.

A new FPFO is under development by the State Forestry Board. This plan will outline both planning and management policies for all of Oregon's forest lands. The objective is to preserve the forest base through the involvement of other local, state and federal agencies in the forest land planning process. The FPFO clearly states that forestry policies for public lands are not necessarily appropriate for private lands. Also the FPFO will explicitly mandate that the generation of revenues from BOF lands is paramount with other provisions to be taken into account.

The State-wide planning goals are the guiding principles for the management of state public lands. Four State planning goals are of particular interest to public forest land planning: Goal 1 outlines the provisions for public participation in the planning process; Goal 2 outlines the basic procedures for Oregon's State-wide Planning Program; Goal 4 addresses that forests should be preserved for forest uses; and Goal 5 establishes a process whereby resources are inventoried and evaluated in order to identify areas requiring sensitive planning treatment.

Long Range Timber Plans are the main tool for the management of state owned lands. Directed by the State Forestry Board, planning is undertaken by a team of Department of Forestry forest managers and department staff in each region. Although oriented towards timber management, policies within these plans also take into account other forest uses such as recreation. Timber Plans are developed in three stages. Initially, appropriate laws and policies are reviewed. An inventory of the forest resources is also undertaken. Economic forecasting, environmental considerations and timber projections are required within this inventory. Based on this information, a series of decision packages are presented to the planning team. Consensus on one package constitutes acceptance of the Long Range Timber Plan. The Department of Fish and Wildlife may review the Timber Plan at this time. Only after the plan has been approved by the State Forester and the Forestry Board does the public have any opportunity to review a Timber Plan. Where required, more specific plans, such as block management plans, may be developed and implemented by a similar process.

Both formal and informal processes exist to minimize planning conflicts. Statute requires that other agencies, including local government and the public, be consulted during plan development. Informally it is required that state agency programs coordinate with local comprehensive plans to ensure continuity in planning.

Formal reviews are completed on a rotation basis through the forest regions every five to six years. Continued compliance with comprehensive plans and state goals must be assessed. New information on forest growth and yield is used to amend and revise plans. Amendments must be approved the State Forestry Board.

There is no board comparable to LUBA to handle appeals of Long Range Timber Plans or their provisions. Recourse is limited to procedural challenges under the FPA i.e., the Department of Forestry has not undertaken a legislated duty. Conflicts are to be minimized through coordination within the planning process.

Public Involvement (Forest Planning)

There is a mandatory provision for public participation in the long range timber planning process through the State Forestry Board. This public board receives input from the public which should be reflected in the management decisions of the board. Also there are provisions for input during planning through hearings and draft plan review. However since the Department of Forests mandate is to maximize revenues from the land base, public input is not actively solicited since input generally demands management actions which would be in contravention of this goal.

Environmental Impact Assessment (Forest Planning)

There is no legislative or policy provision requiring the completion of a comprehensive environmental assessment on each of the decision packages (see EIA section above).

D) PLANNING PRODUCTS

The planning product is a comprehensive plan which is implemented through zoning and ordinances which have the force of law.

Long Range Timber Plans set policies and guidelines for management of the public forest resource. Management practices will be directed to the maximization of timber revenues.

3.8 SASKATCHEWAN

The Department of Parks and Renewable Resources is the primary Crown land agent in Saskatchewan, accountable for the administration, management and planning of 93 million acres (37.7 million hectares) of Crown resource lands comprising 53% of the province.

The Resource Lands Branch of the Department of Parks and Renewable Resources is responsible for all Crown "resource" lands in Saskatchewan. In southern Saskatchewan, the Department of Rural Development administers rural land. The Department of Urban Affairs is responsible for municipal planning in northern Saskatchewan and in municipalities.

A) LEGISLATIVE BASE

The Department of Parks and Renewable Resources is responsible for formulating and implementing land use policies for lands under its jurisdiction pursuant to the Parks Act, the Forest Act and the Provincial Lands Act. The department reviewed land related policy and procedures with the aim of establishing a land planning program from 1987 to 1989. The resulting proposed operational and administrative framework for the allocation of public land is awaiting Cabinet approval in 1990. Currently, these proposals are not in the public forum and therefore not described in this report.

The Planning and Development Act R.S.S. 1983, outlines the municipal planning framework for the province. Under the Act, the Crown is bound to municipal zoning bylaws concerning land use and development, with the exception of forest harvesting operations. The Department of Parks and Renewable Resources participates in a number of municipal planning projects as well as carrying out a limited planning program for Crown land where no Municipal Development Plan is in place. The Ministers of Urban Affairs or Rural Development may initiate and make recommendations to Cabinet respecting provincial land use policies.

B) JURISDICTION AND AUTHORITY

Figure 3.22 - Planning Authorities

Municipal councils may, by bylaw, establish municipal planning commissions to advise on matters pertaining to community planning and development within the municipality.

A Provincial Planning Appeals Board, consisting of three to nine members, is appointed by the Lieutenant Governor in Council. The Appeals Board hears and determines appeals in all cases stemming from interpretation of provisions set forth in the Planning and Development Act.

C) PLANNING PROCESS

Figures 3.23 and 3.24 - Approval procedures for Municipal Development Plans and Subdivision Approval Procedures. Environment Canada Working Paper 28, pg.132.

The Department of Parks and Renewable Resources has recently completed "Guidelines for Sale, Lease or Permit of Crown Land". The guidelines provide for the mechanisms and conditions for disposition of land as well as a broad level zoning plan under a Special Management Areas Policy. As well as an operational and administrative framework, the guidelines include an "early warning" system for potential land use and resource conflicts and guiding principles for environmental quality and resource enhancement. The guidelines are presently not public, pending government approval in 1990.

The approval procedures for Municipal Development Plans and subdivision approval are outlined in Figures 3.23 and 3.24. Such plans fall under the jurisdiction of either the Department of Rural Development or the Department of Urban Affairs.

Environmental impact assessment

Figure 3.25 - Saskatchewan Environment Assessment and Review Process.

The Environmental Assessment Act R.S.S. 1980 provides for the assessment of projects in Saskatchewan. Assessments are required for development projects which are likely to:

- affect unique, rare or endangered features
- preempt the use of a resource for other purposes
- cause widespread public concern
- involve new resource utilization technologies
- have significant impact on the environment

Figure 3.22 - Saskatchewan Planning Authorities

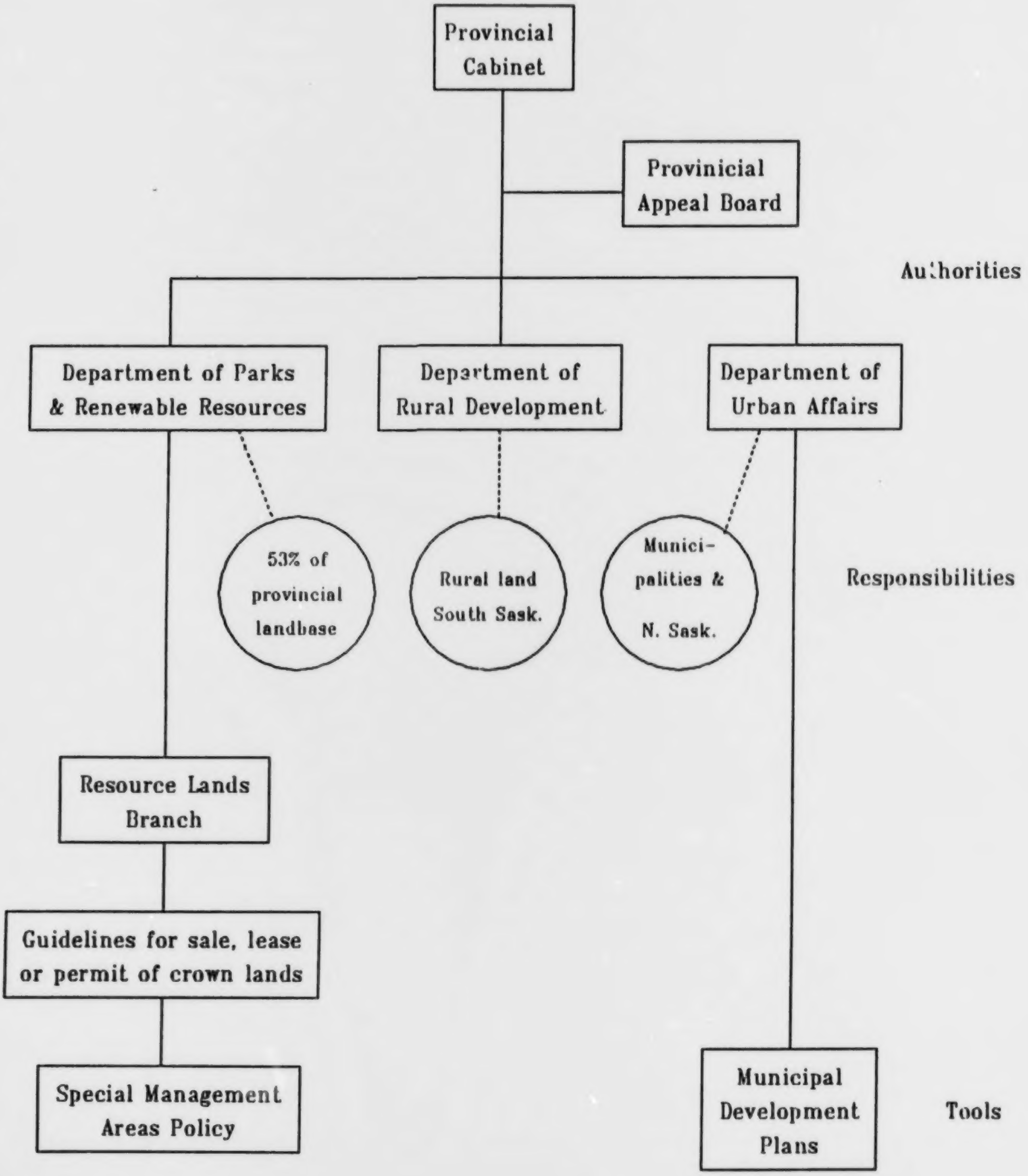

Provincial Cabinet
Provinicial Appeal Board
Authorities
Department of Parks & Renewable Resources
Department of Rural Development
Department of Urban Affairs
53% of provincial landbase
Rural land South Sask.
Munici-palities & N. Sask.
Responsibilities
Resource Lands Branch
Guidelines for sale, lease or permit of crown lands
Special Management Areas Policy
Municipal Development Plans
Tools

Figure 3.23

Approval Procedures For Municipal Development Plans in Saskatchewan

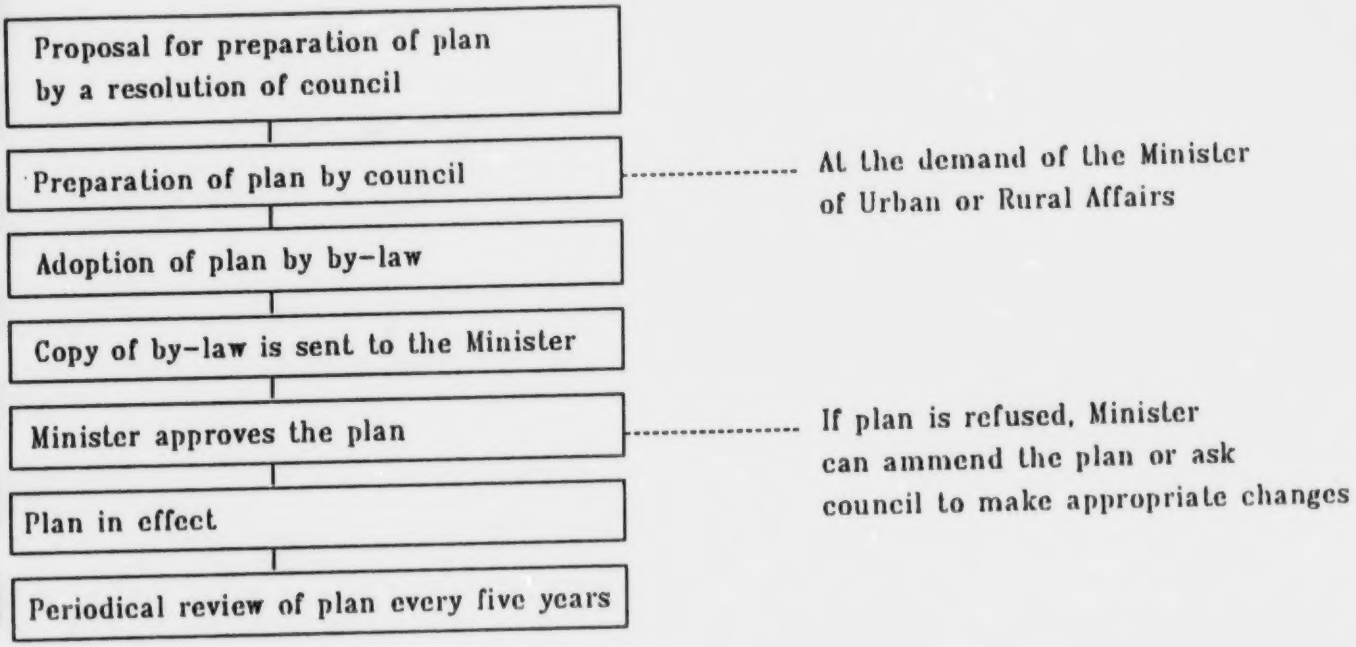
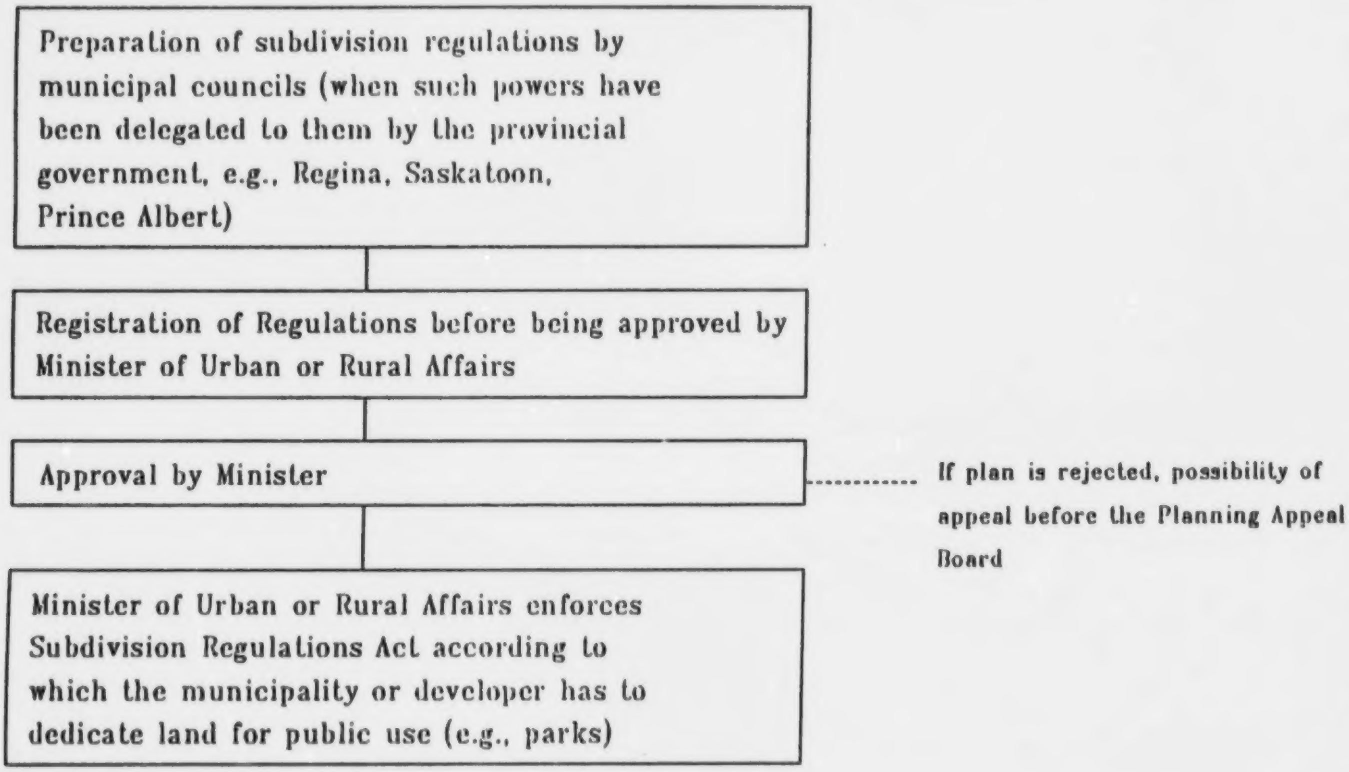

Proposal for preparation of plan by a resolution of council
Preparation of plan by council
At the demand of the Minister of Urban or Rural Affairs
Adoption of plan by by-law
Copy of by-law is sent to the Minister
Minister approves the plan
If plan is refused, Minister can ammend the plan or ask council to make appropriate changes
Plan in effect
Periodical review of plan every five years

Figure 3.24
Subdivision Approval Procedures in Saskatchewan



Preparation of subdivision regulations by municipal councils (when such powers have been delegated to them by the provincial government, e.g., Regina, Saskatoon, Prince Albert)

Registration of Regulations before being approved by Minister of Urban or Rural Affairs

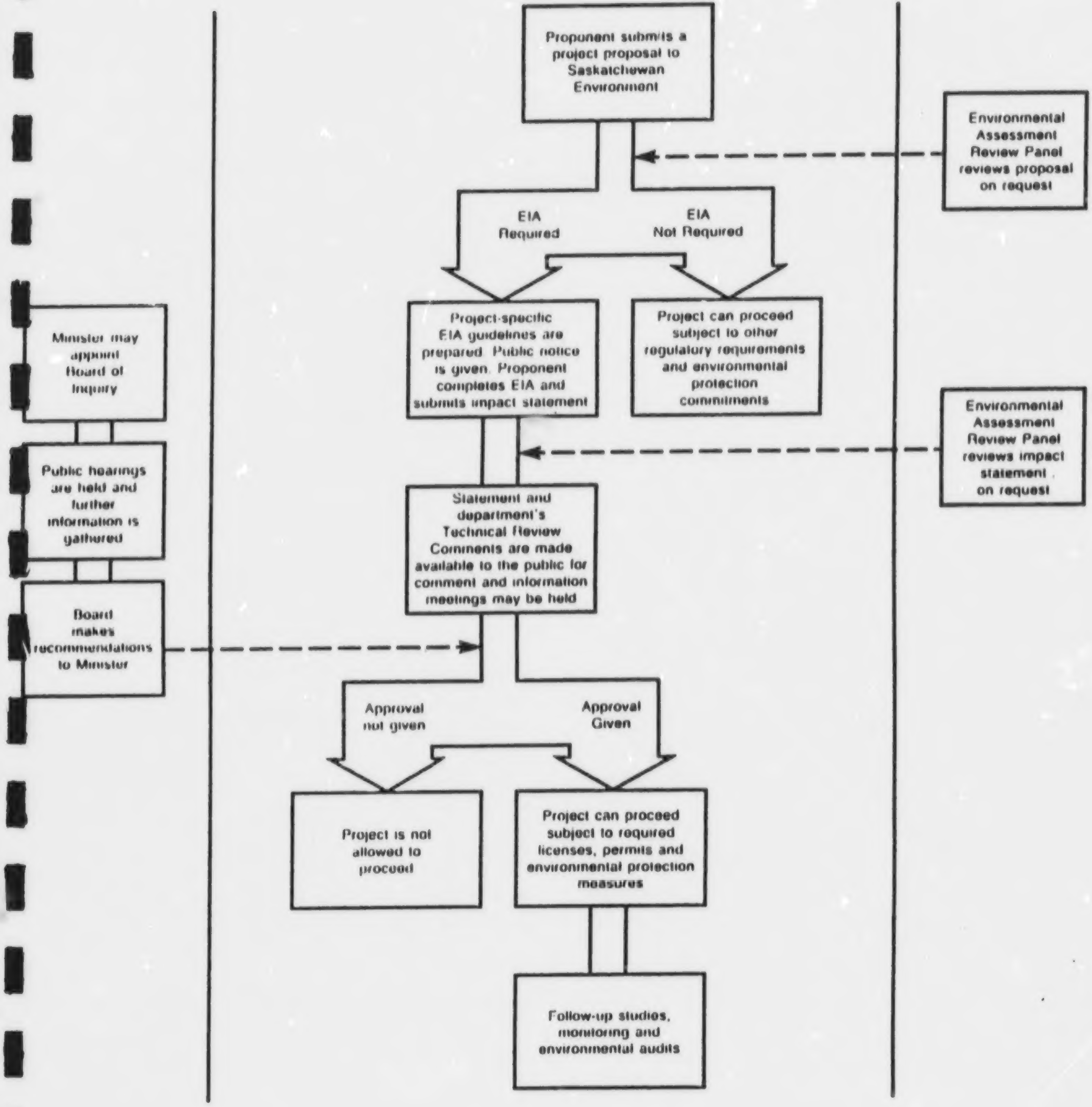
Approval by Minister

If plan is rejected, possibility of appeal before the Planning Appeal Board

Minister of Urban or Rural Affairs enforces Subdivision Regulations Act according to which the municipality or developer has to dedicate land for public use (e.g., parks)

Figure 3.25

Saskatchewan Environmental Assessment and Review Process


Proponent submits a project proposal to Saskatchewan Environment
Environmental Assessment Review Panel reviews proposal on request
EIA Required
EIA Not Required
Minister may appoint Board of Inquiry
Project-specific EIA guidelines are prepared. Public notice is given. Proponent completes EIA and submits impact statement
Project can proceed subject to other regulatory requirements and environmental protection commitments
Environmental Assessment Review Panel reviews impact statement on request
Public hearings are held and further information is gathered
Statement and department's Technical Review Comments are made available to the public for comment and information meetings may be held
Board makes recommendations to Minister
Approval not given
Approval Given
Project is not allowed to proceed
Project can proceed subject to required licenses, permits and environmental protection measures
Follow-up studies, monitoring and environmental audits

A proponent may be a provincial department or agency, a provincial Crown corporation, a municipality, a private corporation or an individual who proposes or desires to undertake a development. Developments may be exempted from the application of the act only in cases of emergency. The Minister of Environment and Public Safety may withhold information related to a development except where such information relates to pollutants, public health or human safety.

An Interdepartmental Review Panel composed of representatives from government departments serves in an advisory capacity to the Environment Assessment Branch of the Department of Environment and Public Safety. The panel advises on such matters as the need for an impact assessment, the depth of study required and the adequacy of submitted impact statements. A Board of Inquiry, with members having full authorities of commissioners under the Public Inquiries Act, may be established at the discretion of the Minister of Environment and Public Safety. There is no provision for appeals.

The Environmental Assessment and Review process is outlined in Figure 3.25. Approval for developments is granted by the Minister of Environment and Public Safety under the Environmental Assessment Act. Where a conflict exists between approvals granted under any other Act, regulation or bylaw and a condition of ministerial approval, the condition of ministerial approval prevails.

D) PLANNING PRODUCTS

Special Management Areas may be designated by the Minister of Parks and Renewable Resources under departmental policy. The Special Management Areas Policy is, in effect, a broad level zoning scheme directing the allocation of land to a wide variety of users. By declaring such special planning areas, the Minister acknowledges that the planning concerns and the scope of planning in the area exceed municipal jurisdiction, being provincial in nature. Such Ministerial orders are motivated by concerns to protect natural resources such as floodplains and agricultural lands; wilderness and natural sites; natural reservoirs; historic and cultural sites; and new town sites.

Municipal Development Plans are the principle mechanism used to regulate and control development. Both urban and rural municipalities may prepare such plans. Two or more municipalities may group by agreement to develop a District Development Plan. To date, such planning districts have usually involved urban-rural fringe areas, but as mentioned above, the planning framework proposals are still at the developmental stage and very little of the Province is covered by this type of plan.

3.9 QUEBEC

Over 90% of the lands in Quebec are Crown owned. The province has a decentralized approach to land use planning, giving considerable responsibility for planning to local authorities in the southern portion of the province. Regional bodies, called Regional County Municipalities (RCMs) coordinate the efforts of local municipalities in developing land use plans. The RCMs generally cover the territory south of 52 degrees longitude. Of the 681,199 km^2 of land in RCMs, 572,649 km^2 (84%) is Crown land. Land use planning in Northern Quebec is the responsibility of the ministere d'Energie et des Ressources (MER).

Environmental assessments follow a differing set of regional divisions. Assessments are undertaken according to five distinct systems, depending upon whether the project is in an area subject to agreements with native people.

A) LEGISLATIVE BASE

The Land Use Planning & Development Act S.Q. 1979 c.51 is the major legislation governing public lands in Quebec. Provisions in the Act stipulate that a Regional County Municipality (RCM) must prepare a land use development plan which will reflect both municipal and departmental policies regarding use of the land. Such policies are forwarded to the Secretariat a l'Amenagement, then to the ministere des Affaires Municipales.

B) JURISDICTION AND AUTHORITY

The primary responsibility for land use planning in Quebec lies with Regional Council Municipalities under the Land Use Planning and Development Act, 1979.

Two provincial departments hold the bulk of responsibility for managing Crown lands - the ministere d'Energie et des Ressources (MER) manages the majority of public lands while the ministere de l'Environnement manages the lands forming the bed of rivers and lakes and lands along their banks. All demands regarding public land uses are sent to the MER. This department then consults informally with other affected or interested departments.

Each Regional County Municipality is directed by a council comprised of the mayors of the municipalities within the region. There are no direct elections to the RCM, mayors sit on the council with a number of votes proportional to the population and economic weight of their respective jurisdiction. The Prefect (head) of the RCM is elected by those mayors on the council.

The departmental committee on planning and regional development (COMPADR), is responsible for coordinating government policies and activities involving Crown lands. It is a committee of the Council of Ministers and was established in 1978. The ministre a l'Amenagement et a la Decentralisation chairs the committee. Other members include the ministers of les Affaires Municipales, du Loisir, de la Chasse et de la Peche, and de l'Environnement.

The Commission nationale de l'amenagement oversees land development plans in the province. It is composed of five members appointed by the government. The Commission determines whether a particular planning program complies with the objectives of a RCM development plan; whether a municipal bylaw or zoning complies with the municipal planning programs; and whether a government intervention complies with the objectives of a development plan.

Development plans are enforced through the Quebec Superior Court. When presented with a petition, the Court orders the ceasing of actions that are incompatible with the planning bylaws in effect. The Superior Court can also order work that is required to make land use comply with the law and bylaws and, if no other solutions are feasible, the demolition of buildings or restoration of land.

In the area of agricultural land use, Quebec enacted the Act to Preserve Agricultural Land in 1978 (RSQ, c. P-41.1). The Act established zoning to distinguish agricultural land from other properties, imposed measures designed to protect agricultural land from encroachment by other activities, and set up a commission charged with overseeing the protection of agricultural land (CPTA). The Act was amended in 1989 (RSQ, c. 7). The changes included provision for an independent tribunal to hear appeals of decisions of the CPTA, appointment of a commissioner to hear complaints of agricultural producers regarding application of municipal bylaws, and new provisions to protect agricultural activities.

C) PLANNING PROCESS

Figures 3.26 and 3.27 - Decision Levels in Land Planning and Jurisdiction of RCMs. Environment Canada Working Paper no. 28 pg 114.

Figure 3.28 - Planning Process in Quebec. Environment Canada Working Paper no. 28 pg 122.

Figure 3.29 - Harmonization Process.

The Land Use Planning & Development Act S.Q. 1979 c.51 sets out four principles governing land use planning and development in the province:

- planning is a political responsibility, not simply a technical exercise, so it should be elected officials who make choices, decisions and conciliate any differences of opinion;

- citizens should be involved in the different phases of planning by means of a mandatory process of information and consultation;

- planning is a shared responsibility of the three levels of decision-making - municipality, regional county municipality and provincial government - with each having an area of responsibility;

- planning requires coordination and conciliation through exchanges of information and harmonization of objectives and projects between each level of government.

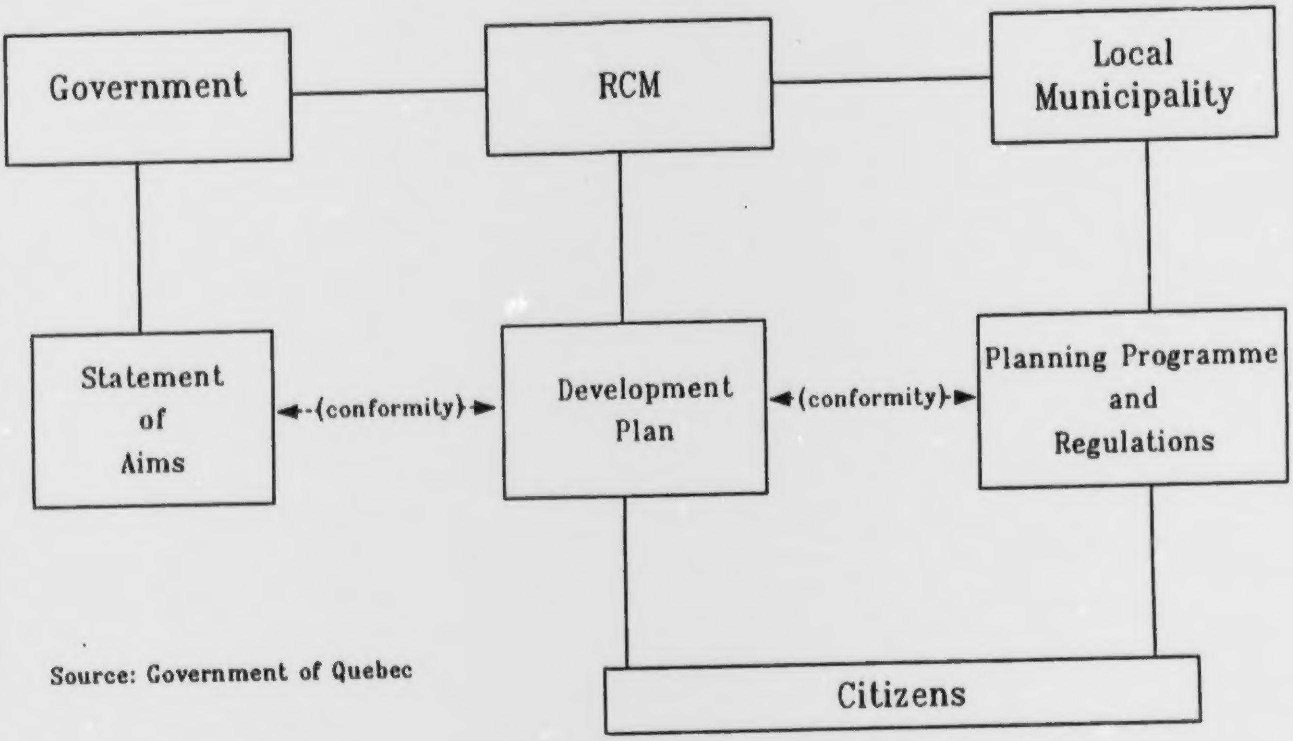
Land development plans in the province are prepared under the responsibility of two Ministers under the Land Use Planning & Development Act. The Minister of Municipal Affairs is responsible for providing documentation and technical assistance in the preparation of plans. The Minister of State for Planning assumes the coordination of government departments in presenting the government's objectives which must be established during the preparation of development plans.

The Regional County Municipality prepares a preliminary development plan and circulates it to municipalities, adjacent RCMs and the Commission nationale de l'amenagement. The RCM receives opinions on the preliminary proposal and adopts a development proposal. A copy of this is then sent to the Minister, municipalities and neighboring RCMs. The RCM revises the development proposal and prepares the final version of the plan for a second round of consultation. The development plan can then be adopted by resolution of the Regional County Municipal council. The plan is then forwarded to the Secretariat a l'Amenagement, then to the ministere des Affaires Municipales for final review. Once the plan has been adopted, municipalities in the RCM must adopt a planning program for crown and municipal lands with zoning, subdivision and building bylaws consistent with the plan's objectives.

In reality, the RCMs are constrained by the higher provincial authority. They must operate within provincial guidelines and final authority is not as devolved as it might be. However, the potential for such devolution is there in the planning framework.

Figure 3.26 Quebec

Decision Levels in Land Planning


Government
RCM
Local Municipality
Statement of Aims
(conformity)
Development Plan
(conformity)
Planning Programme and Regulations
Citizens

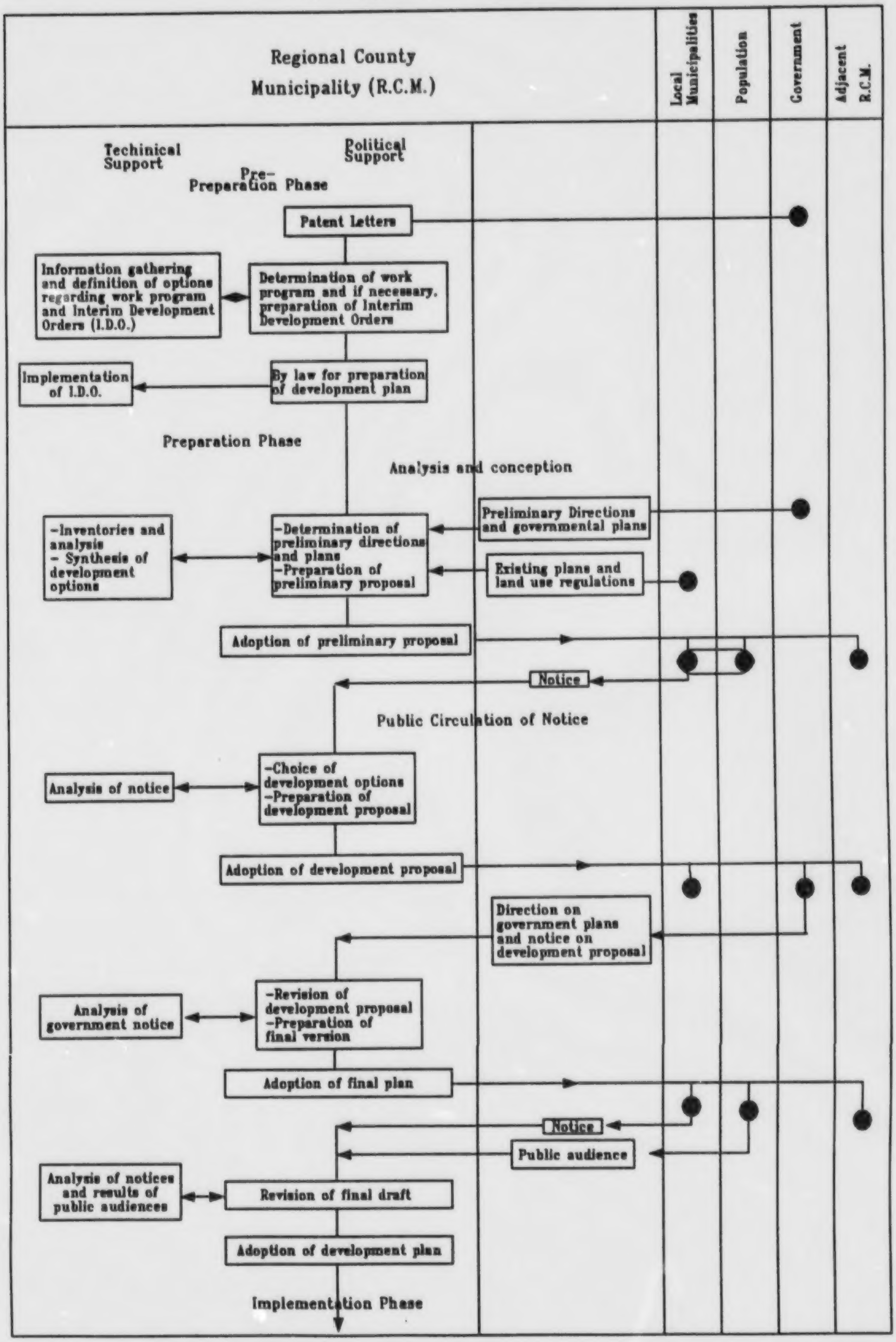
Source: Government of Quebec

Figure 3.27 Jurisdiction of Regional County Municipality

	In Respect to a Special Act	In Respect to the Land Use Planning and Development Act	General Administration	
Nature of Jurisdiction	- Compulsory: Real estate assessment in rural municipalities Sale of immoveables due to non-payment of taxes Registration offices Roads, bridges and water courses Regulation and administration of non-organized territories - Optional: Management of a waste management system Dispatch of notices and tax bills, tax collection Collection of duties on transfers of immoveables Establishment of retirement funds Others	- Compulsory: Preparation and adoption of development plan Revision of development plan - Optional: Adoption of interim control regulation Amendments to the development paln Jurisdiction over cities and towns of the RCM - real estate assesement - collection of duties - tranfers of immoveables - operation of a waste management system	NOT linked to land planning i.e. hiring of assessment agent	Linked to land planning i.e.. planning offices
			Personnel management Management of offices Financial management Secretariat services	
Financial Contribution	Only municipalities under the Municipal Code	All member municipalities	All municipalities subject to the Management Code and Cities and Towns Act that desire it.	All municipalities in RCM (financial assistance program).
Participation in Voting and Deliberations			Municipalities under RCM and Cities and Towns that have chosen to contribute financially.	All municipalities in the RCM.

Source: Government of Quebec

Figure 3.28 Quebec
Planning Process in Quebec

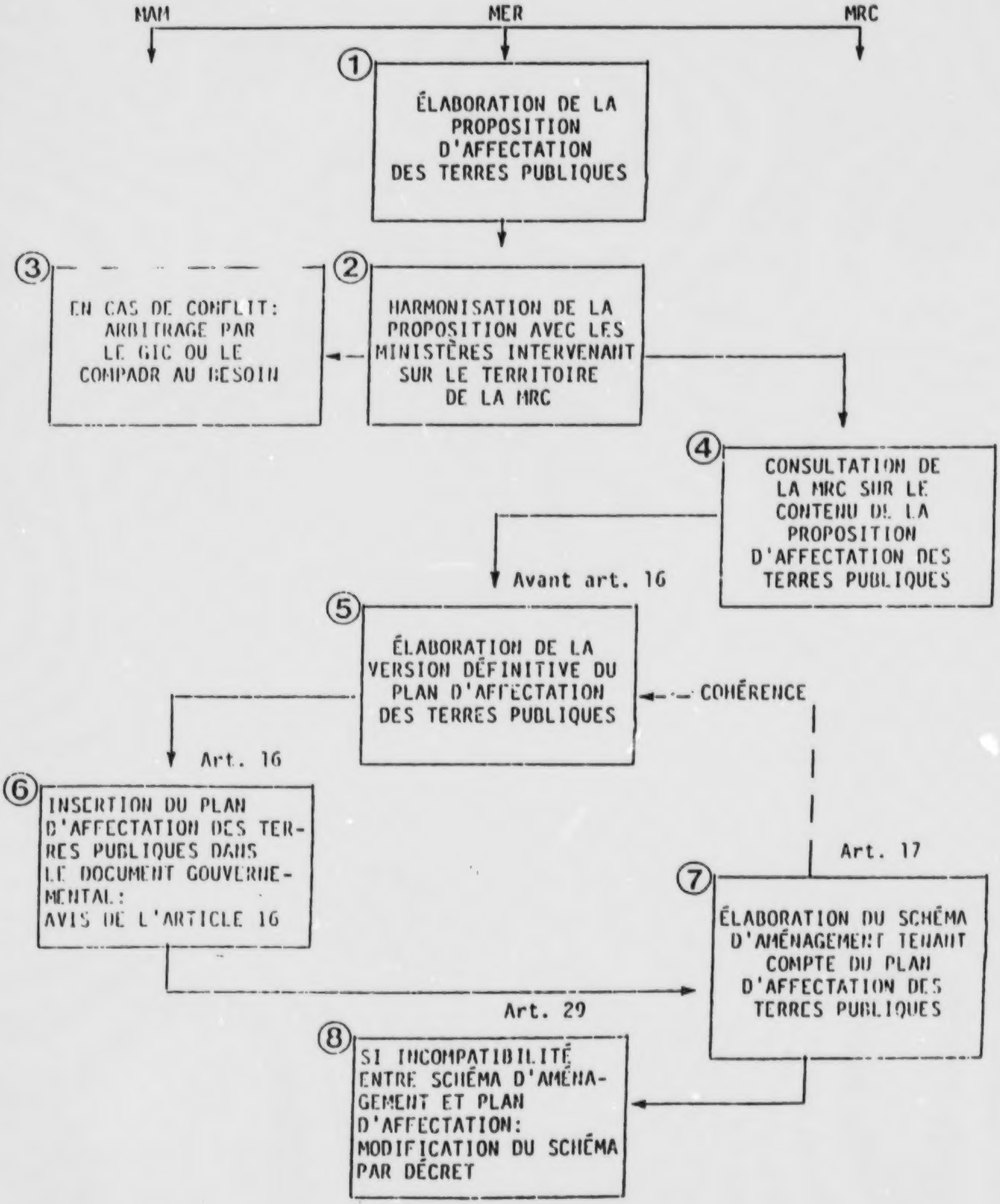


Regional County Municipality (R.C.M.)
Local Municipalities
Population
Government
Adjacent R.C.M.
Techinical Support
Political Support
Pre-Preparation Phase
Patent Letters
Information gathering and definition of options regarding work program and Interim Development Orders (I.D.O.)
Determination of work program and if necessary, preparation of Interim Development Orders
Implementation of I.D.O.
By law for preparation of development plan
Preparation Phase
Analysis and conception
Preliminary Directions and governmental plans
-Inventories and analysis
- Synthesis of development options
-Determination of preliminary directions and plans
-Preparation of preliminary proposal
Existing plans and land use regulations
Adoption of preliminary proposal
Notice
Public Circulation of Notice
Analysis of notice
-Choice of development options
-Preparation of development proposal
Adoption of development proposal
Direction on government plans and notice on development proposal
Analysis of government notice
-Revision of development proposal
-Preparation of final version
Adoption of final plan
Notice
Public audience
Analysis of notices and results of public audiences
Revision of final draft
Adoption of development plan
Implementation Phase

Source: Government of Quebec

Figure 3.29

PROCESSUS D'HARMONISATION DU PLAN D'AFFECTATION DES TERRES PUBLIQUES ET DU SCHÉMA D'AMÉNAGEMENT DE LA MUNICIPALITÉ RÉGIONALE DE COMTÉ


MAM
MER
MRC
① ÉLABORATION DE LA PROPOSITION D'AFFECTATION DES TERRES PUBLIQUES
② HARMONISATION DE LA PROPOSITION AVEC LES MINISTÈRES INTERVENANT SUR LE TERRITOIRE DE LA MRC
③ EN CAS DE CONFLIT: ARBITRAGE PAR LE GIC OU LE COMPADR AU BESOIN
④ CONSULTATION DE LA MRC SUR LE CONTENU DE LA PROPOSITION D'AFFECTATION DES TERRES PUBLIQUES
Avant art. 16
⑤ ÉLABORATION DE LA VERSION DÉFINITIVE DU PLAN D'AFFECTATION DES TERRES PUBLIQUES
COHÉRENCE
Art. 16
⑥ INSERTION DU PLAN D'AFFECTATION DES TERRES PUBLIQUES DANS LE DOCUMENT GOUVERNEMENTAL: AVIS DE L'ARTICLE 16
Art. 17
⑦ ÉLABORATION DU SCHÉMA D'AMÉNAGEMENT TENANT COMPTE DU PLAN D'AFFECTATION DES TERRES PUBLIQUES
Art. 29
⑧ SI INCOMPATIBILITÉ ENTRE SCHÉMA D'AMÉNAGEMENT ET PLAN D'AFFECTATION: MODIFICATION DU SCHÉMA PAR DÉCRET

Public Involvement

The Land Use Planning & Development Act S.Q. 1979 c.51 establishes a public consultation process, giving RCMs the responsibility for soliciting public input and holding public meetings in preparing land use development plans.

Environmental impact assessment

Figure 3.30 - Quebec - Impact Assessment Systems

Figure 3.31 - Quebec Environmental Impact Assessment and Review Procedure.

In Quebec, environmental assessments are undertaken according to five distinct systems, depending upon the location of the project. If, for example, the project is in Cree, Inuit or Naskapi territory, the proposal is subject to review under distinct procedures established under the claims agreement for the area.

The Environment Quality Act (1972) applies to projects in southern Quebec. The Act was amended in 1978 to allow individual citizens the right to institute legal action against a proponent in the case of an offence under the Act. The assessment procedure is administered under regulations issued by the provincial government. Projects may be exempted from the procedure by the Government or by a designated Cabinet committee order.

The Quebec Ministry of the Environment is responsible for review of project EIA Statements and recommendations to the Minister regarding the environmental acceptability of projects. Le Bureau d'audiences publiques sur l'environnement (BAPE) is responsible for holding public hearings on projects and preparing reports to the Minister on the public's concerns. Members of the BAPE have powers and immunities of commissioners appointed under the Public Inquiry Commission Act.

Environmental assessments are undertaken in Cree and Inuit territories under terms outlined in the Environment Quality Act (RSQ, c Q-2). Consultation with native people is provided through committees to which they appoint representatives. These committees advise the Deputy Minister of the Environment before a decision is made on a given project. Projects necessarily subject to and exempted from these procedures are detailed in Schedules to the Act.

Under the Forests Act, 1988, the primary allocation mechanism for Crown forest lands is the Forest Allocation and Management Contract (CAAF). The underlying principle of these contracts is "forest yield", which is defined as the maximum volume of wood that can be harvested annually in perpetuity in an area. The calculation of forest yield is conducted by the MER by taking into account the restrictive and exclusive areas of the public lands land use plan. An area is awarded to a business under a 25-year contract, reviewed every 5 years, with the recipient responsible for all work and treatments required to achieve the proposed annual yield.

D) PLANNING PRODUCTS

Figures 3.32 and 3.33 - Content of a Regional Development Plan and Public Participation Process. Environment Canada Working Paper no 28, pg 121.

Figure 3.30

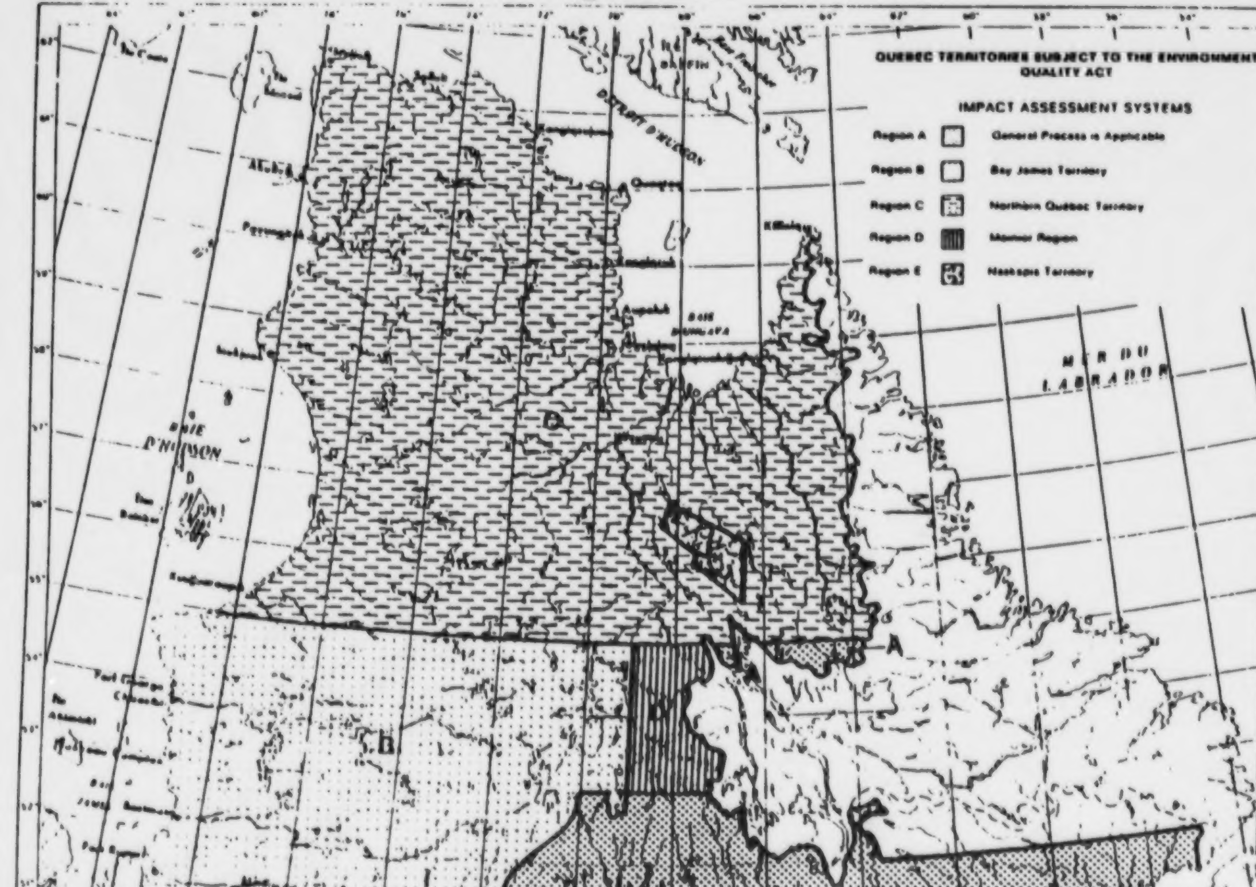

QUEBEC TERRITORIES SUBJECT TO THE ENVIRONMENT QUALITY ACT
IMPACT ASSESSMENT SYSTEMS
Region A General Process is Applicable
Region B Bay James Territory
Region C Northern Québec Territory
Region D Moinier Region
Region E Naskapis Territory
DETROIT D'HUDSON
BAIE D'HUDSON
BAIE UNGAVA
MER DU LABRADOR
GOLFE DU SAINT-LAURENT
A
B
C
D
0 100 200 300 400 km

Figure 3.31

ENVIRONMENTAL IMPACT ASSESSMENT AND REVIEW PROCEDURE

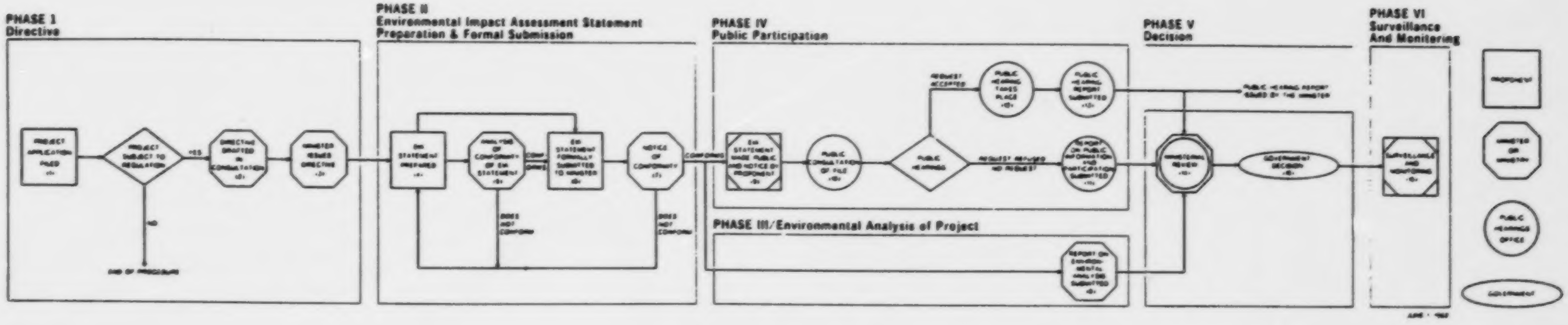
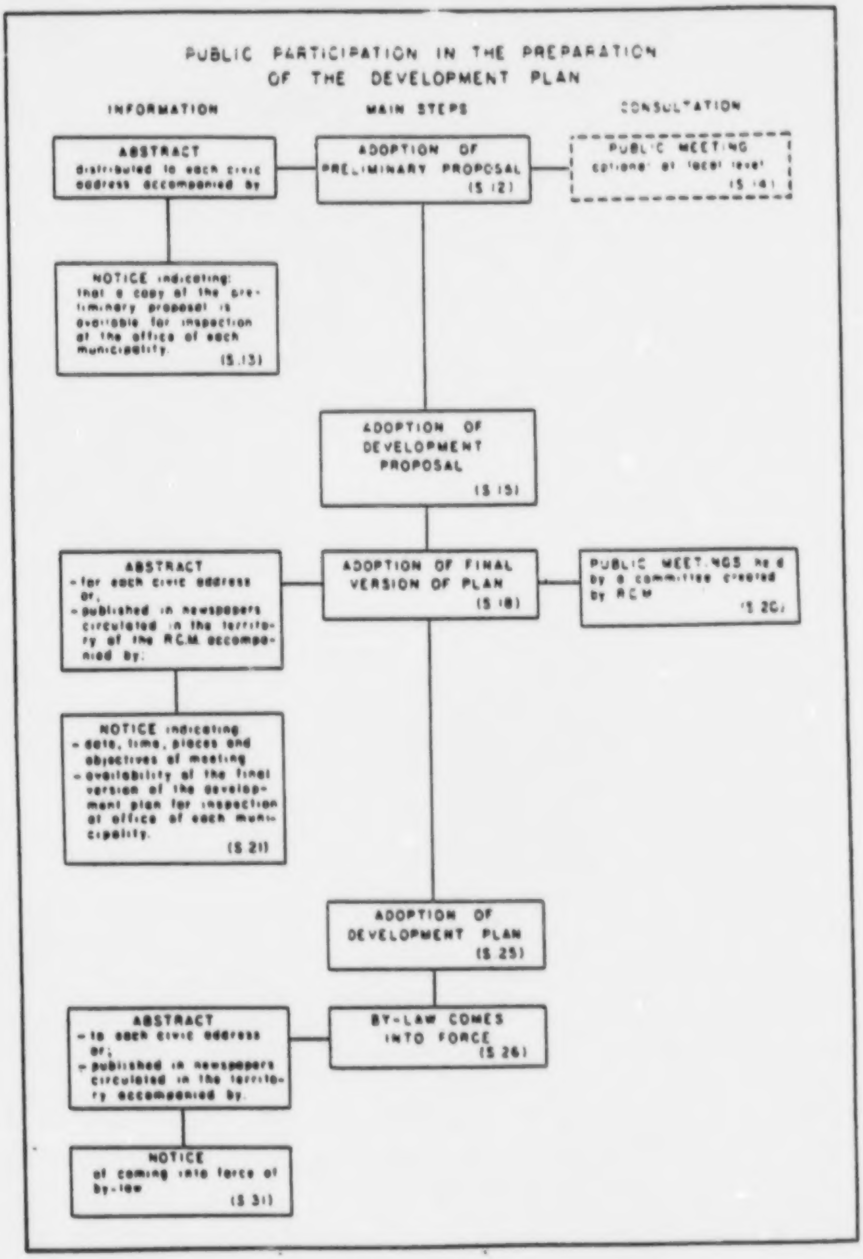

PHASE 1
Directive
PROJECT APPLICATION FILED
PROJECT SUBJECT TO REGULATION
YES
NO
END OF PROCEDURE
DIRECTIVE DRAFTED IN CONSULTATION
MINISTER ISSUES DIRECTIVE
PHASE II
Environmental Impact Assessment Statement Preparation & Formal Submission
EIA STATEMENT PREPARED
ANALYSIS OF CONFORMITY OF EIA STATEMENT
CONFORMS
EIA STATEMENT FORMALLY SUBMITTED TO MINISTER
DOES NOT CONFORM
NOTICE OF CONFORMITY
DOES NOT CONFORM
CONFORMS
PHASE IV
Public Participation
EIA STATEMENT MADE PUBLIC AND NOTICE BY PROPONENT
PUBLIC CONSULTATION OF FILE
PUBLIC HEARINGS
REQUEST ACCEPTED
PUBLIC HEARING TAKES PLACE
PUBLIC HEARING REPORT SUBMITTED
REQUEST REFUSED NO REQUEST
REPORT ON PUBLIC INFORMATION AND PARTICIPATION SUBMITTED
PHASE III/Environmental Analysis of Project
REPORT ON ENVIRONMENTAL ANALYSIS SUBMITTED
PHASE V
Decision
PUBLIC HEARING REPORT ISSUED BY THE MINISTER
MINISTERIAL REVIEW
GOVERNMENT DECISION
PHASE VI
Surveillance And Monitoring
SURVEILLANCE AND MONITORING
PROPONENT
MINISTER OF ENVIRONMENT
PUBLIC HEARINGS OFFICE
GOVERNMENT

Figure 3.32

CONTENT OF A REGIONAL DEVELOPMENT PLAN		
	COMPULSORY CONTENT	OPTIONAL CONTENT
PRINCIPLES, GOALS AND DEVELOPMENT OBJECTIVES	GENERAL AIMS of land development (s.5.)	
VOCATION FOR VARIOUS PARTS OF THE TERRITORY	GENERAL POLICIES for the whole territory of the R.C.M. Delimitation of the URBANIZATION PERIMETERS.	APPROXIMATE DENSITY of occupation. LAND USES within the urbanization perimeters that present an interest to the R.C.M.
CONSTRAINTS OR PARTICULAR INTERESTS	Identification of ZONES WHERE LAND OCCUPATION IS SUBJECT TO SPECIAL RESTRICTIONS FOR REASONS OF PUBLIC SAFETY Identification of territories that are of HISTORICAL, CULTURAL, AESTHETIC, OR ECOLOGICAL INTEREST to the R.C.M.	JOINT DEVELOPMENT PROPOSAL emanating from a group of joint municipalities. Description of those parts of the territory of the R.C.M. that are exempt from stalking out within the meaning of the Mining Act.
WORKS AND INFRASTRUCTURES	Identification and approximate location and, where applicable, the schedule for the setting up of the PUBLIC SERVICES AND INFRASTRUCTURES which the R.C.M. considers to be INTERMUNICIPAL IN NATURE. Identification and approximate location of the PUBLIC SERVICE AND INFRASTRUCTURE TO BE SET UP BY THE GOVERNMENT, the government departments and agencies and by public bodies and school corporations. Identification and approximate location of MAJOR ELECTRICITY, GAS, TELECOMMUNICATIONS AND CABLE DELIVERY NETWORKS.	approximate network and type of MAIN TRAFFIC ROADS.
ADDITIONAL DOCUMENT RELATING TO CERTAIN CONTROL MECHANISM	MINIMUM STANDARDS to be respected by municipal by-laws. These must apply to zones subject to special restrictions for reasons of special safety. (s. 5)	For the whole or part of the territory, a municipal council may adopt a by-law prescribing CERTAIN CONDITIONS FOR GRANTING BUILDING PERMITS GENERAL STANDARDS must take into account existing municipal by-laws.
DOCUMENT RELATIVE TO COSTS OF DEVELOPMENT PROPOSALS	a document indicating the ESTIMATED COST OF THE VARIOUS INTERMUNICIPAL PUBLIC SERVICES AND INFRASTRUCTURES. (s.7)	
DOCUMENT RELATIVE TO CONSULTATION	a document indicating MODES OF CONSULTATION AND CONCLUSION DRAWN specified by persons and bodies consulted for their agreement. (s.7)	

Figure 3.33


PUBLIC PARTICIPATION IN THE PREPARATION OF THE DEVELOPMENT PLAN
INFORMATION
MAIN STEPS
CONSULTATION
ABSTRACT distributed to each civic address accompanied by
ADOPTION OF PRELIMINARY PROPOSAL (S.12)
PUBLIC MEETING optional at local level (S.14)
NOTICE indicating: that a copy of the preliminary proposal is available for inspection at the office of each municipality. (S.13)
ADOPTION OF DEVELOPMENT PROPOSAL (S.15)
ABSTRACT - for each civic address or, - published in newspapers circulated in the territory of the R.C.M. accompanied by:
ADOPTION OF FINAL VERSION OF PLAN (S.18)
PUBLIC MEETINGS held by a committee created by R.C.M. (S.20)
NOTICE indicating - date, time, places and objectives of meeting - availability of the final version of the development plan for inspection at office of each municipality. (S.21)
ADOPTION OF DEVELOPMENT PLAN (S.25)
BY-LAW COMES INTO FORCE (S.26)
ABSTRACT - to each civic address or; - published in newspapers circulated in the territory accompanied by.
NOTICE of coming into force of by-law (S.31)

The Land Use Planning & Development Act S.Q. 1979 c.51 stipulates that a Regional County Municipality (RCM) must prepare a land use development plan which will reflect both municipal and departmental policies regarding use of the land.

The development plan is a statement of the general aims of land development policy for the lands of the RCM. It must include development objectives, general policies on land use, delimitation of urbanization perimeters and special interest zones.

3.10 PRINCE EDWARD ISLAND

Prince Edward Island is the smallest province in Canada with a total land area of 570,000 hectares. Settlement on the island began in the 1700s and today less than 2% of the island remains as Crown land. The Property and Surveys section of the Department of Transportation and Public Works oversees provincial Crown land holdings of 8-10,000 hectares.

A) LEGISLATIVE BASE

The Land Development Corporation was established as a Crown agency under the Department of Agriculture and Forestry in the Land Development Corporation Act, 1969, c.40, S.1. The Public Works Act, 1972 empowers the Department of Transportation and Public Works to hold Crown land on behalf of other government departments. Planning procedures and provision for a Land Use Commission are embodied in the Planning Act, 1988. The Prince Edward Island Lands Protection Act, 1982, c.16 governs the sale of both private and Crown owned lands to individuals who do not reside in the province. The province has also on several occasions amended the Real Property Act, 1974, c.R-4 in response to increasing non-resident ownership of large tracts of land. The Natural Areas Protection Act, 1988 enables the protection of ecologically important areas on Crown lands and, with the consent of the owner, on private lands. The Forest Management Act, 1988 has influence on the management of forests and other resources on both Crown and private lands.

B) JURISDICTION AND AUTHORITY

Two agencies have administrative responsibilities for provincial lands, the Department of Transportation and Public Works and the Prince Edward Island Land Development Corporation (LDC). Land planning in the province is administered by the Department of Community and Cultural Affairs.

The Department of Transportation and Public Works has the right to hold land on behalf of all other government departments for such public uses as highways and parks. In addition to administering these lands, the department also manages some of the lands owned by the Land Development Corporation.

The LDC is a Crown corporation structured primarily for the acquisition of agricultural lands. Its mandate was subsequently expanded to enable the purchase of lands for other uses, such as recreation, fish and wildlife and forestry.

Land Use Commission (LUC) - This commission was initially created under a separate act in 1974. The Act was later repealed and provisions for the commission were made under the Planning Act, 1988. There are seven members on the commission, appointed from the private sector by Cabinet. The commission makes recommendations on: land use in inland and coastal areas; recreational subdivision and highway development policies; policies relating to the establishment and operation of regional, joint and municipal planning boards; and policies relating to the transfer of land held by partnerships or corporations.

The LUC assists planning boards and approves official plans after they have been adopted by municipal councils. It may also appoint a planning board for an area which does not have a municipal organization. The commission acts as an administrative and judicial court in a manner similar to that of the Ontario Municipal Board. Anyone dissatisfied with a decision made in the administration of the Planning Act may appeal to the commission. The decision of the commission can be challenged in Court.

The Land Use Commission reviews all applications for land purchase made under the Prince Edward Island Lands Protection Act. The Act stipulates that no person or corporation can acquire large land holdings without a permit issued by the Lieutenant Governor-in-Council. A similar permit is required for non-residents to acquire land which is greater than ten acres in size or includes more than five chains of waterfront.

Originally intended as an advisory body to Cabinet, the LUC currently makes decisions on formal appeals under the Planning Act. The Act also provides for judicial review of decisions made by the commission. In 1989, the LUC met for over 140 days, holding public hearings on three major issues: the conservation of an area of sand dunes; the subdivision of an offshore island; and a shopping centre development proposal. Generally, however, the commission meets between 25 and 50 days a year.

Land Development Corporation - This body was created in 1969 in response to loss of agricultural land to other land uses. Its purpose was to provide assistance to the farming industry by acquiring land to be managed for farming. This was later expanded to include acquiring lands for tourism and outdoor recreation, forestry, wildlife and community pasture use. The LDC presently holds 60-80,000 hectares of land.

The structure of the LDC includes a board which guides the corporation and a working committee which advises it. Board members are general residents of Prince Edward Island who are appointed by the Executive Council. Provision is also made for provincial government representation on the board. The advisory committee, referred to as the Land Leakage Committee, reviews properties prior to purchase by the corporation and assists in delineating the best use and management of lands following their acquisition.

Through its role as a land purchasing agent, the LDC entered the market as an intermediary to permit landowners to sell their property at an assured fair market value. The LDC played a passive role in transactions as a buyer of last resort. Properties, once purchased, were released as farms, used to assist in consolidation of adjacent properties, retained as community pasture, or provided to other government departments for maintenance as forest, wildlife or recreational reserves. Due to increased costs of land purchase and decreased government funding the LDC has been less active in the land market since about 1978. In the early 1980s the LDC moved from a land banking function to one of providing financing to individuals for the purchase of farm properties or woodlots. Changes to the Planning Act in 1988 permit the LDC to also hold lands identified for non-development.

C) PLANNING PROCESS

Figure 3.34 - Municipal Development Plan Adoption and Approval Process in PEI, Fig 20 Environment Canada Working Paper no. 28, pg 108.

The Planning Act, 1988 sets out the process by which municipalities in PEI. plan and manage land, as well as provisions for the Land Use Commission which oversees the planning process. The Act and commission were established subsequent to a Royal Commission on Land Ownership and Land Use which held public hearings throughout the province in 1972. A 1989 Royal Commission on Land is again studying the issue of land ownership and prices. The commission will be reporting to the government in 1990.

The municipal planning process described in the Planning Act is voluntary. Preparation of an official plan is the responsibility of the municipality, which can be an incorporated city, town, village, community improvement committee or planning area. Municipal councils may appoint a planning board with the powers to prepare an official plan and hold public meetings for the purpose of obtaining the participation and cooperation of local inhabitants. An official plan may include a statement of policy regarding the development and use of land in the area and the reservation of land for public purposes. The plan must include a map of permitted land use classes for the area and proposals as to the content of zoning bylaws.

Before approving the proposed plan, the planning board must hold public hearings. The board then submits the plan to council for adoption. After council has adopted the proposed plan, it is forwarded to the Land Use Commission for approval. Prior to approval, the commission may hold further public hearings. Following commission approval, the document becomes the official plan of the delineated area. A council can then draft zoning bylaws to carry out the intent of the plan. Regulations must be submitted to the Land Use Commission after they have been adopted by council.

Environmentally sensitive or unique areas may be protected as Special Planning Areas under the Planning Act. In such areas, development may not be undertaken without prior approval in writing of the Minister through the Department of the Environment. Special Planning Areas may be designated to provide for provincial parks, to protect beaches and beachlands from undesirable development, or to preserve fragile environments and special ecological features. Conservation zones, which prohibit changes in land use and construction of buildings, may also be designated under the Planning Act.

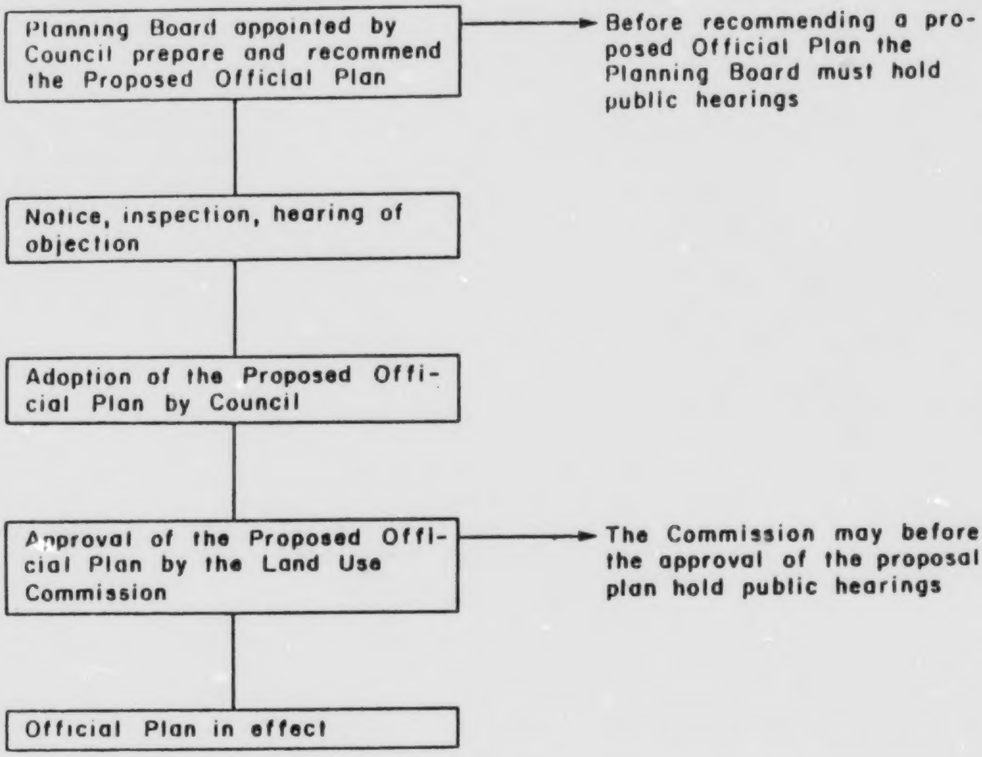
Land use controls have also been implemented through legislation other than the Planning Act. The Prince Edward Island Lands Protection Act restricts land transfers by size and residency requirements. In another example, amendments to the Real Property Act in 1986 and 1987 instituted a double tax on properties owned by non-islanders.

Public participation

Provisions for public participation in the planning process are made in the Planning Act. Public meetings must be held by a planning board before any proposed official plan is recommended to council for adoption. Before a council adopts or revokes a plan, notice of its intention to do so must be made in local daily newspapers. The council must make suitable provision for inspection of the proposed plan and provide a suitable place for the hearing of objections. The same procedures are followed in the case of regional plans or in any alterations to an official plan.

Figure 3.34

MUNICIPAL DEVELOPMENT PLAN ADOPTION AND APPROVAL PROCESS IN PRINCE EDWARD ISLAND


Planning Board appointed by Council prepare and recommend the Proposed Official Plan
Before recommending a proposed Official Plan the Planning Board must hold public hearings
Notice, inspection, hearing of objection
Adoption of the Proposed Official Plan by Council
Approval of the Proposed Official Plan by the Land Use Commission
The Commission may before the approval of the proposal plan hold public hearings
Official Plan in effect

Note: The same process applied to a regional plan. Two or more municipalities may by agreement constitute a Joint Planning Board. The Joint Planning Board shares the same powers and duties as the Planning Board.

The Land Use Commission must hold public hearings before it recommends to the Executive Council any guidelines, programs or changes related to land use policies. The commission must also consult with any group or organization in the province that expresses an interest in the subject.

Environmental impact assessment

The Environment Protection Act, 1988 authorizes the Minister of Community and Cultural Affairs to require an environmental assessment for an undertaking that may have environmental impacts. The Environmental Management Division of the Department of Community and Cultural Affairs is responsible for administering the act. The division reviews proposals for undertakings that may have an adverse environmental impact and makes recommendations to the Minister. The Minister determines if the public should be informed about an undertaking and whether there is a need for specific public comment on the project and the environmental impact statement. The Minister gives written approval of the undertaking, with or without conditions, or rejects it.

The Land Use Commission can be used by any person who is dissatisfied with a decision that has been made by a provincial or municipal authority that functions under authority of the Planning Act. Reasons for appeal can include a proposal's potentially adverse environmental impacts. Appeals to the commission must be made within 45 days of the authority's decision. The LUC is independent of Cabinet, with its powers granted by statute, whereas Environmental Assessment Panels are empowered only to make recommendations to the Minister.

Under the Electric Power and Telephone Act, a public utility must submit an environmental impact assessment to the Public Utilities Commission when it proposes any project that may have potentially significant environmental impacts. After public hearings, the commission issues findings with respect to the application and makes recommendations to the Executive Council for final decision.

D) PLANNING PRODUCTS

The major planning product in Prince Edward Island is the official plan prepared by a municipality under the Planning Act. Plans must include a map of permitted land use classes within the area and the phasing of development or redevelopment plans for any area. Once the plan is official, council has the power to buy, sell, lease or dispose of land, make bylaw regulations regarding zoning, and define the boundaries of areas to which regulations are applied.

Joint plans may be prepared by two or more municipalities under mutual agreement. The plan is prepared by a joint planning board with the same powers and duties as a municipal planning board. There are two such regional bodies in PEI: the Charlottetown Area Regional Planning Board and the Summerside Area Regional Planning Board.

3.11 YUKON TERRITORIES

Virtually all of the land in the Yukon Territories is federal crown land (99.8%). Presently, there is a federal policy to progressively transfer the provincial-like responsibilities now mandated to the Northern Affairs Program of Indian and Northern Affairs Canada(DIAND) to the Government of the Yukon. The move to afford greater jurisdiction to the territorial government with respect to land use planning and natural resources was evinced by the 1988 Mine Safety transfer and by ongoing negotiations with respect to health care and forestry.

A) LEGISLATIVE BASE

DIAND is the major authority for administering crown land in Yukon. Since regulation is still under federal jurisdiction, DIAND has been given all responsibility for land use allocation through its enabling act (Indian Affairs and Northern Development Act) and the Territorial Lands Act (except for matters relating to fisheries, migratory birds and wildlife covered by other federal acts or Yukon government ordinances).

A number of other acts concerning land allocation are also administered by DIAND. They include mining and mineral leasing, water use, and the preservation of the natural landscape. Gradually these will be devolved to the Territorial government.

The Territorial Lands Act (1950), Section 8 clarifies the mechanism of land transfers and other responsibilities to the territorial government. It also outlines the process for land and resource disposition. Devolution of responsibilities to the Yukon will occur over time as the Yukon government assumes a greater role in the overall management of the territory.

B) JURISDICTION AND AUTHORITY

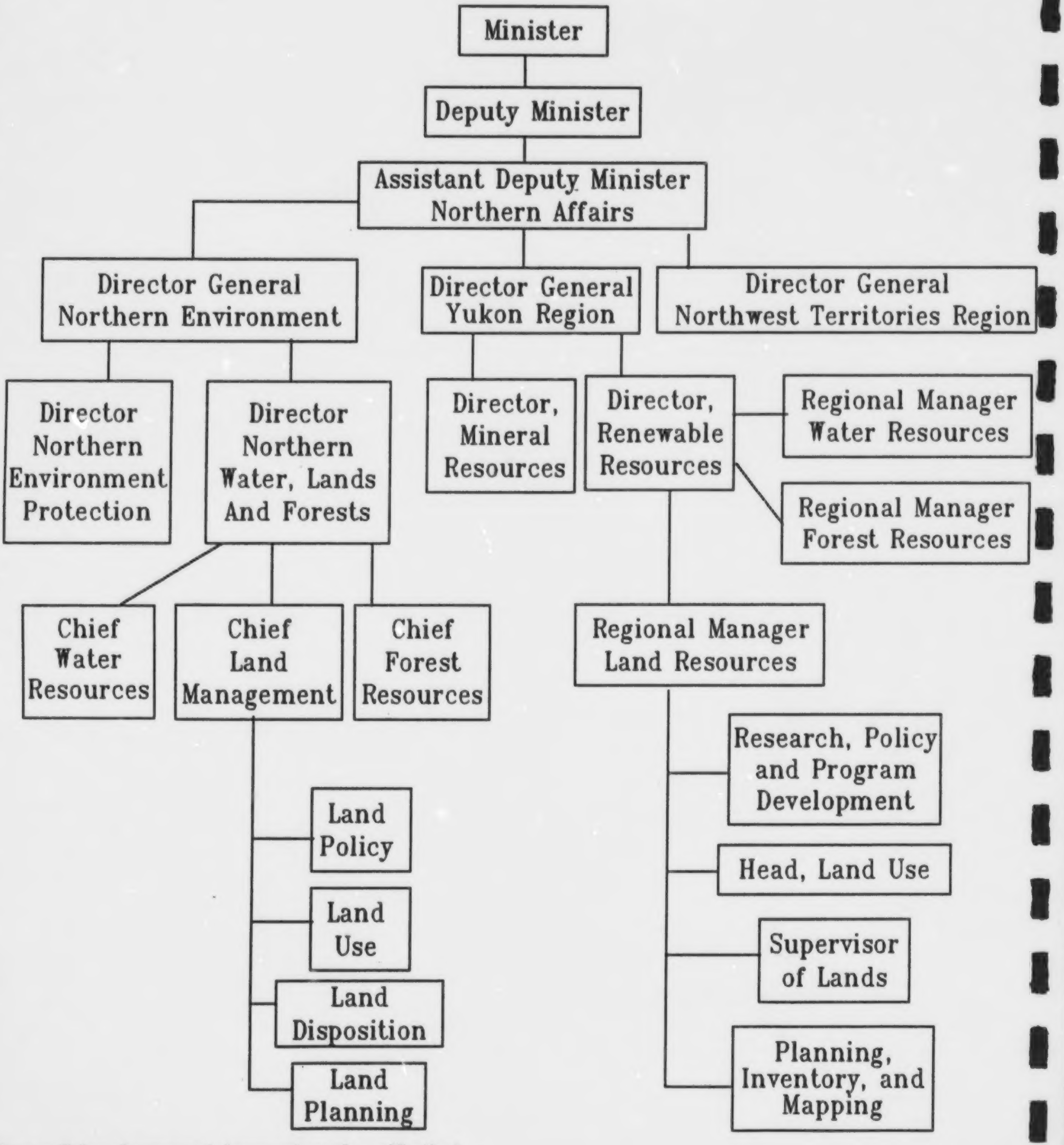
Jurisdiction now belongs to DIAND but the Territorial government is represented on all pertinent committees and boards. According to the Yukon Act (1954), the land remains vested in Her Majesty in right of Canada. The proceeds of the lands conferred to the Commissioner (wildlife management and roads) are realized by the Territorial government. However, the vast majority of the proceeds from such things as land leases, licences, timber dues, and quarrying fees still go to the federal government. Responsibility for the various resources and land allocations are redistributed to organizations within the Northern Affairs program of DIAND.

At present, there exists a Framework Agreement for a comprehensive Yukon Native Land Claim Settlement which will lead to an Umbrella Final Agreement (UFA). This will permit continued controlled transfer of responsibility to the territorial government. Consequently, a Yukon Economic Strategy (YES) and a Yukon Conservation Strategy (YCS) have been developed with a primary goal being sustainable development.

Management responsibilities are delegated to the DIAND Northern Affairs Program and the 10 interrelated organizations under it: the Planning and Support Directorate, the Constitutional Development and Strategic Planning Branch, the Constitutional Development and Aboriginal Affairs Directorate, the Circumpolar and Scientific Affairs Directorate, the Natural Resources and Economic Development Branch, the Resource Planning and Coordination Directorate, the Mining and Infrastructure Directorate, the Economic Development Directorate, the Oil and Gas Management Directorate, and the Comprehensive Claims Branch. (See Figure 3.35)

After the settlement of the Yukon Native Land Claim, it is proposed in the UFA that the responsibilities for resource management and land use planning will be shared between the federal and territorial governments and the Yukon First Nations. Control of land and resources transferred through the native land claims will rest with the Yukon First Nations. Development and access issues will be equitably dealt with under the development process and proposed surface rights legislation.

Figure 3.35 DIAND Organization for Land Management


Minister
Deputy Minister
Assistant Deputy Minister Northern Affairs
Director General Northern Environment
Director General Yukon Region
Director General Northwest Territories Region
Director Northern Environment Protection
Director Northern Water, Lands And Forests
Director, Mineral Resources
Director, Renewable Resources
Regional Manager Water Resources
Regional Manager Forest Resources
Chief Water Resources
Chief Land Management
Chief Forest Resources
Regional Manager Land Resources
Research, Policy and Program Development
Head, Land Use
Supervisor of Lands
Planning, Inventory, and Mapping
Land Policy
Land Use
Land Disposition
Land Planning

Source: Yukon Government document, needs verification!

Environmental Impact Assessment

Because jurisdiction remains in the hands of the federal government, the Environmental Assessment Review Process (EARP) governs the application of impact assessments to any project or plan in the Yukon. This process is administered by the Minister of the Environment through the Federal Environment Assessment Review Office (FEARO) at the request of DIAND (the initiating department). There are two phases in EARP: initial assessment and public review by an EARP panel.

Any project first entering the system as a lease, licence, sale agreement or land use permit application is reviewed by federally appointed resource managers who receive input from the Land Use Advisory Committee or the Federal-Territorial Lands Advisory Committee. The project is accepted, rejected or sent to Level II screening. Here, the Regional Environmental Review Committee (RERC) assesses the project in more detail, requesting more information which could include an Initial Environmental Evaluation (IEE) by the proponent. If the impacts of the project are still in doubt, it is referred to FEARO and the EARP process. (See Figures 3.36 and 3.37)

Under the Yukon Native Land Claim Framework Agreement, there is a provision for a development assessment process which will be a Yukon government responsibility. The new policy developed under the UFA could include an Environmental Bill of Rights, which may contain an environmental impact assessment procedure, strategic and action plans, and monitoring procedures. Compliance with this development assessment process will include individuals, and industry as well as government. In this sense, it requires the government to act as a "model environmental citizen".

C) PLANNING PROCESS

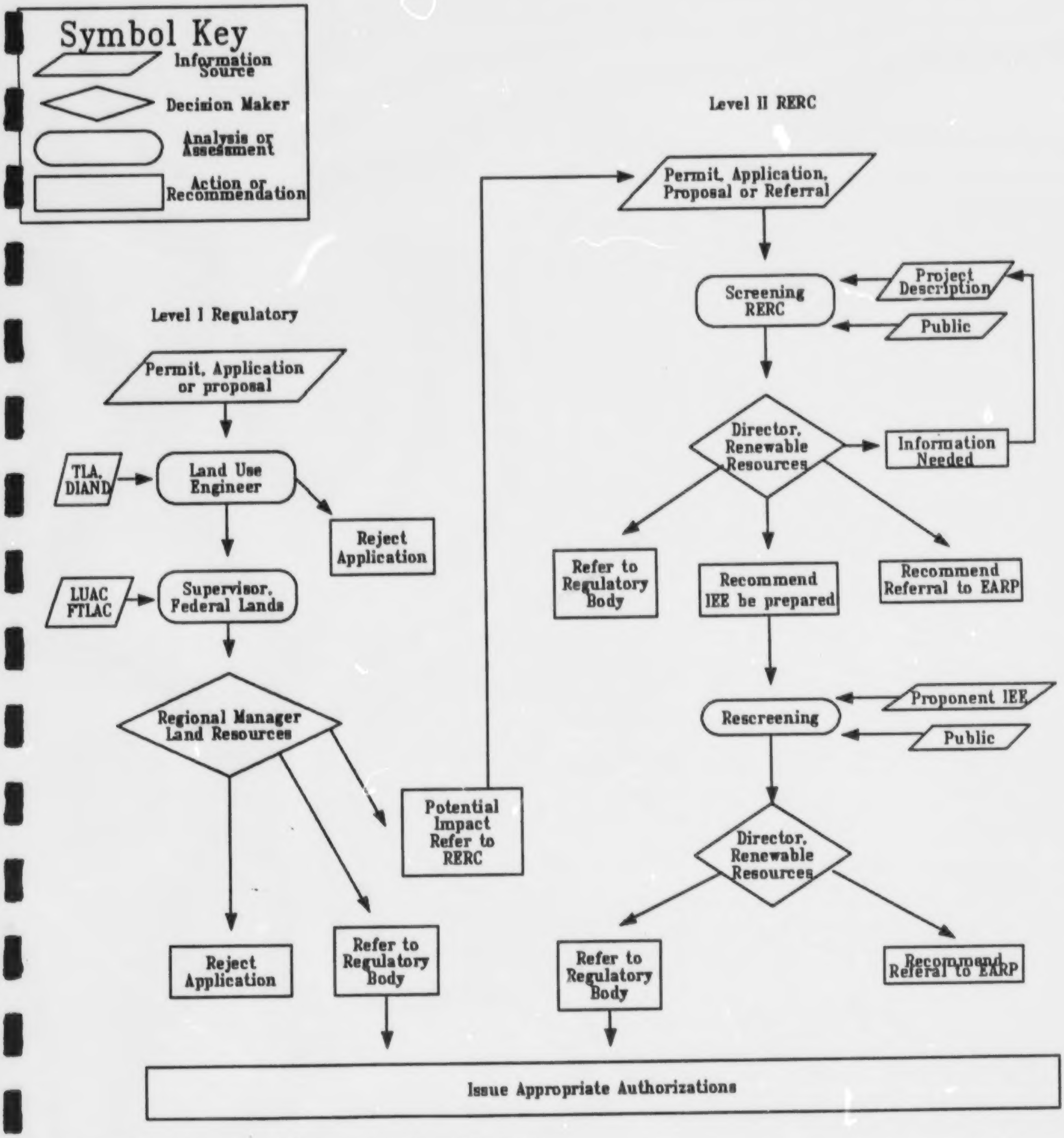
Under the Territorial Lands Act, the federal government, through DIAND, has come to an agreement on land use planning in Yukon (Oct., 1987) with the territorial government and the Council for Yukon Indians. All projects will proceed through a decision making process as described in the Yukon Land Use Planning Agreement. The agreement is designed to ensure that, prior to any project's acceptance, it conform with the regional plan and that input has been received from all concerned. It involves the establishment of regional planning commissions appointed by federal ministers and approval on behalf of a Policy Advisory Committee consisting of representatives from the 3 heads of government (see Figure 3.38).

The territorial and federal ministers approve the proposal's terms of reference on the recommendation of the Council for Yukon Indians and the Policy Advisory Committee. This committee gives advice concerning budget constraints and the territory wide land use management program. The Regional Planning Commissions (specific to each proposal) receive and develop the terms of reference and engage the Land Use Planning Office and its Director to develop a plan. The Regional Planning Commissions then prepare and amend the plan and submit it to the ministers for approval. The plan is rejected with written explanation or receives final approval. Cabinet approval is not necessary but it does assure some commitment.

Under the agreement, all projects will be subjected to analysis under regional committees specific to each proposal. Consultation will involve a policy analysis group and the Council of Yukon Indians. All projects are required to give full opportunity for public involvement in all phases, although there are no provisions for intervener funding. Though there are no formal appeal procedures, conflicts may be resolved through the function of the Land Use Advisory Committee and the Land and Resources Committee.

Figure 3.36

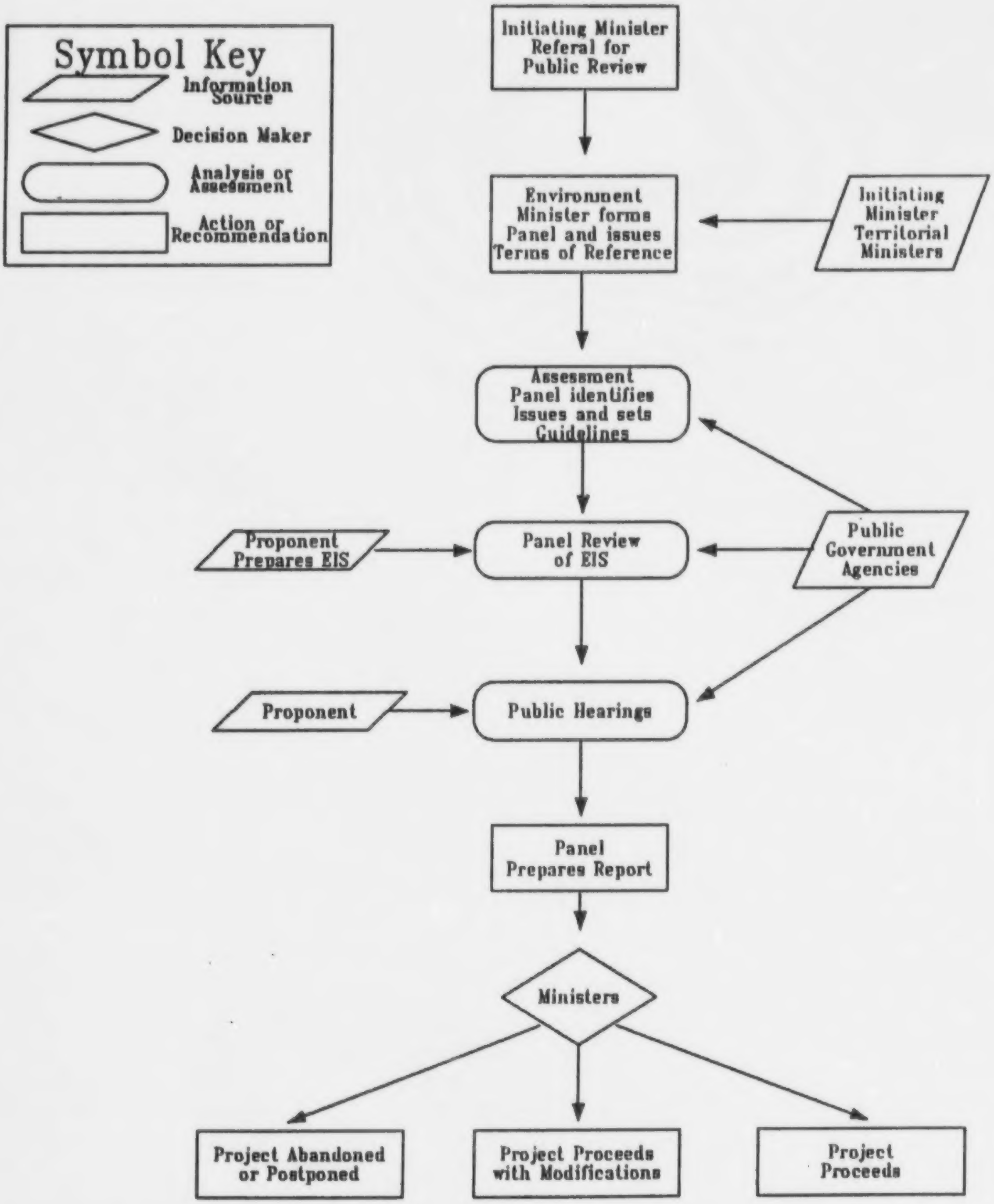
Environmental Assessment and Review Schematic: Initial Assessment


Symbol Key
Information Source
Decision Maker
Analysis or Assessment
Action or Recommendation
Level I Regulatory
Permit, Application or proposal
TLA, DIAND
Land Use Engineer
Reject Application
LUAC FTLAC
Supervisor, Federal Lands
Regional Manager Land Resources
Potential Impact Refer to RERC
Reject Application
Refer to Regulatory Body
Level II RERC
Permit, Application, Proposal or Referral
Screening RERC
Project Description
Public
Director, Renewable Resources
Information Needed
Refer to Regulatory Body
Recommend IEE be prepared
Recommend Referral to EARP
Rescreening
Proponent IEE
Public
Director, Renewable Resources
Refer to Regulatory Body
Recommend Referal to EARP
Issue Appropriate Authorizations

Source: Yukon Government document, needs verification!

Figure 3.37

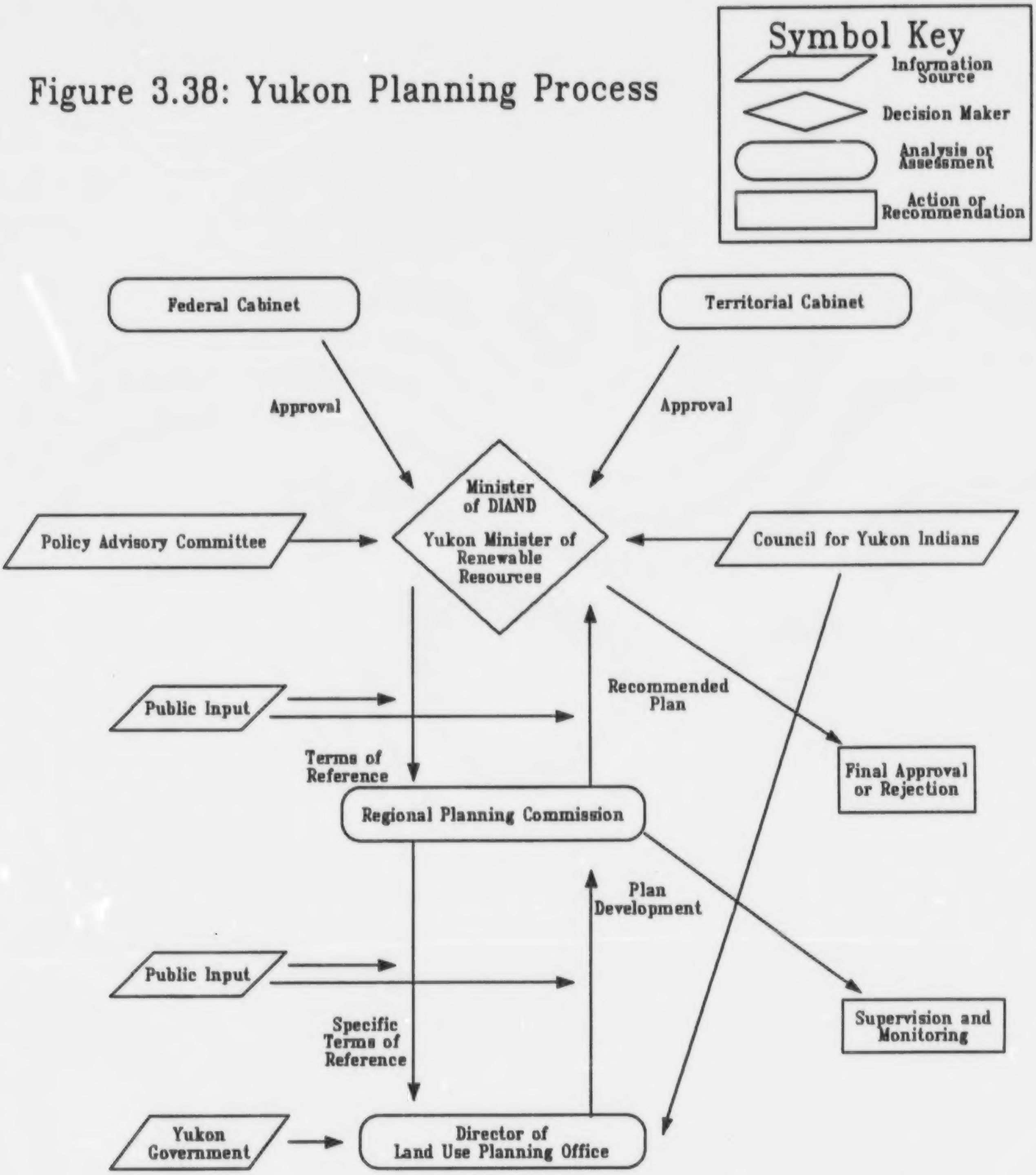
Environmental Assessment and Review Schematic: Panel Review



Symbol Key
Information Source
Decision Maker
Analysis or Assessment
Action or Recommendation
Initiating Minister Referal for Public Review
Environment Minister forms Panel and issues Terms of Reference
Initiating Minister Territorial Ministers
Assessment Panel identifies Issues and sets Guidelines
Proponent Prepares EIS
Panel Review of EIS
Public Government Agencies
Proponent
Public Hearings
Panel Prepares Report
Ministers
Project Abandoned or Postponed
Project Proceeds with Modifications
Project Proceeds

Source: Yukon Government document.

Figure 3.38: Yukon Planning Process


Symbol Key
Information Source
Decision Maker
Analysis or Assessment
Action or Recommendation
Federal Cabinet
Territorial Cabinet
Approval
Approval
Minister of DIAND
Yukon Minister of Renewable Resources
Policy Advisory Committee
Council for Yukon Indians
Public Input
Recommended Plan
Terms of Reference
Final Approval or Rejection
Regional Planning Commission
Plan Development
Public Input
Supervision and Monitoring
Specific Terms of Reference
Yukon Government
Director of Land Use Planning Office

The Water Board holds public hearings concerning licence requests where conflicts may also be resolved.

3.12 UNITED STATES BUREAU OF LAND MANAGEMENT

The Bureau of Land Management(BLM) is entrusted with the management of approximately 342 million acres (138.5 million hectares) of federal public lands across the United States of America - the majority of these lands being situated in the states of Alaska, Washington, Oregon, Montana, Idaho, Nevada, Utah, Colorado, Arizona and New Mexico.

A) LEGISLATIVE BASE

Ultimate authority for the management of BLM lands rests with Congress and the President of the United States of America, who define the mandate and activities of the BLM through Federal laws and regulations. Relevant legislation includes:

> The Federal Land Policy and Management Act, 1976 (FLMPA). This Act legislates the planning requirements for the BLM. Planning is to be interdisciplinary and long-term, based on the principles of multiple resource use and public involvement. This Act is the statutory authority for the management of grazing lands in the United States.
>
> The National Environmental Policy Act, 1969 (NEPA). This Act requires an Environmental Impact Statement (EIS) for all federal proposals which may significantly affect the quality of the human environment. The extensive information required for an EIS (as interpreted by the courts), and the degree of public participation required in the preparation of an EIS are seen to have revolutionized federal land use planning and management.
>
> The National Forest Management Act, 1976 (NFMA). This is the USFS planning act which endorses a commitment to land use planning through multiple-use and sustained yield principles. It may have application to BLM planning activities in some circumstances i.e., Alaska.
>
> The Multiple Use - Sustained Yield Act, 1960 (MUSYA). The purpose of MUSYA is to ensure that national forest lands are used to meet a broad range of demands without impairing the productivity of the resource.
>
> The National Wilderness Act, 1960. This Act is used to set aside wilderness areas from development. This Act has a direct impact on the USFS, less so on the BLM.
>
> The National Wild and Scenic River Act and the Trails System Act, 1968. These Acts protect rivers and trail systems, thereby influencing BLM planning.

The result of this legislation is that much of BLM planning and management is no longer pursued on an ad hoc basis. It is a legislated process which requires resource inventories, economic efficiency, interdisciplinary planning, regular plan review, a high degree of environmental accountability and public involvement.

B) JURISDICTION AND AUTHORITY

Planning and management are undertaken by the BLM through the delineation of resource areas. The size of resource areas varies considerably from thousands of acres to state wide.

Generally the BLM is responsible for the management of federal grazing lands in the lower 48 states and a large section of forest land in Alaska. The United States Forest Service(USFS) manages most federal public forest lands in the contiguous lower states. Although separate agencies, the BLM and the USFS are attempting, where possible, to coordinate their planning and management activities for their mutual benefit.

Planning and management activities for BLM lands are undertaken almost exclusively by the BLM itself (see Figure 3.39). Through the Secretary of the Interior, the Director of the BLM oversees planning by establishing national level policy directives and guidelines for resource planning. Included are policies for specific resources, programs for plan review and amendment, and scheduling and budget requirements. State Directors for the BLM provide mid-level supervision and guidance for planning. District Managers provide general supervision and direction for the preparation of Resource Management Plans(RMPs), the main planning tool for the BLM. Area Managers oversee the development of planning documents by an interdisciplinary planning team, which may contain non-BLM people. Implementation of RMP is also by Area Managers.

C) PLANNING PROCESS

Once guidelines and policies have been established at both the Federal and State levels, the development of RMPs may be undertaken. Even though resource management policies and guidelines are established nationally, they do not define specific resource regulations for the use of BLM lands. This is seen to be advantageous, allowing RMPs to be more responsive to local needs.

FLMPA defines the guiding principles for BLM planning, but does not define a specific planning process for the BLM to follow in the development of an RMP. Therefore, the BLM has developed its own planning process to best suit its goals (see Figures 3.40 and 3.41). An important provision of this evolving process is informal referral during the planning process to minimize conflict and potential litigation.

The development of an RMP is issue driven, therefore not all areas are covered by an RMP. Where an RMP is required, the planning process will have a number of defined action steps. Initially issues, concerns and opportunities for the planning area are defined. Issues are defined by BLM managers, the public, industry, other federal agencies, state and local governments, and Indian tribes. Planning criteria are then developed which delineate the constraints and opportunities for further planning actions. Criteria are defined by laws, executive orders (from the President or Congress), regulations, and Director and State Director guidance.

Information and inventory data collection are undertaken as required to resolve the planning issues identified. Using the information collected, an Analysis of the Management Situation (AMS) is completed. This step judges the ability of the BLM managed resources to provide the goods and services required by society. Being consistent with laws, regulations, Federal and State guidance, and specific regional requirements, planning alternatives which can respond to the issues and opportunities previously identified are established.

Figure 3.39
Planning Authorities - Bureau of Land Management

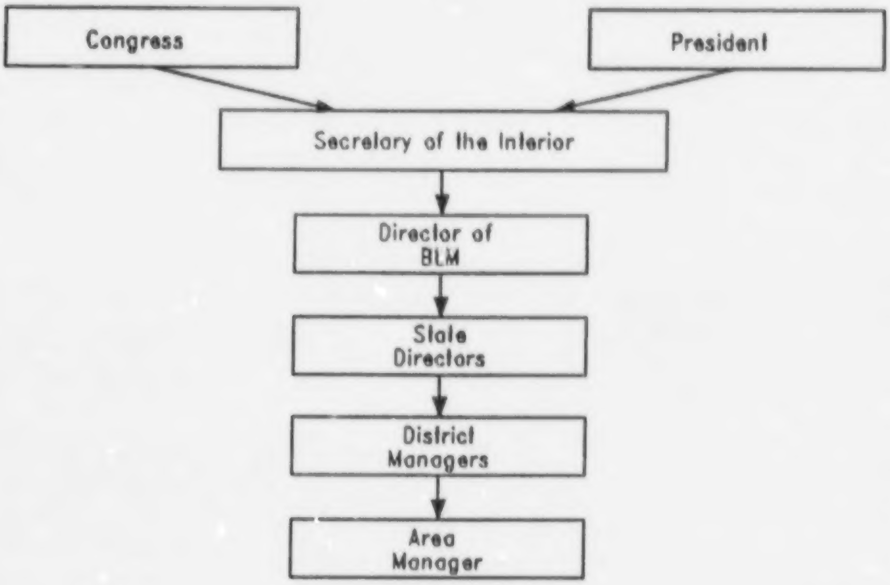

Congress
President
Secretary of the Interior
Director of BLM
State Directors
District Managers
Area Manager

Figure 3.40
Planning Instruments - Bureau of Land Management

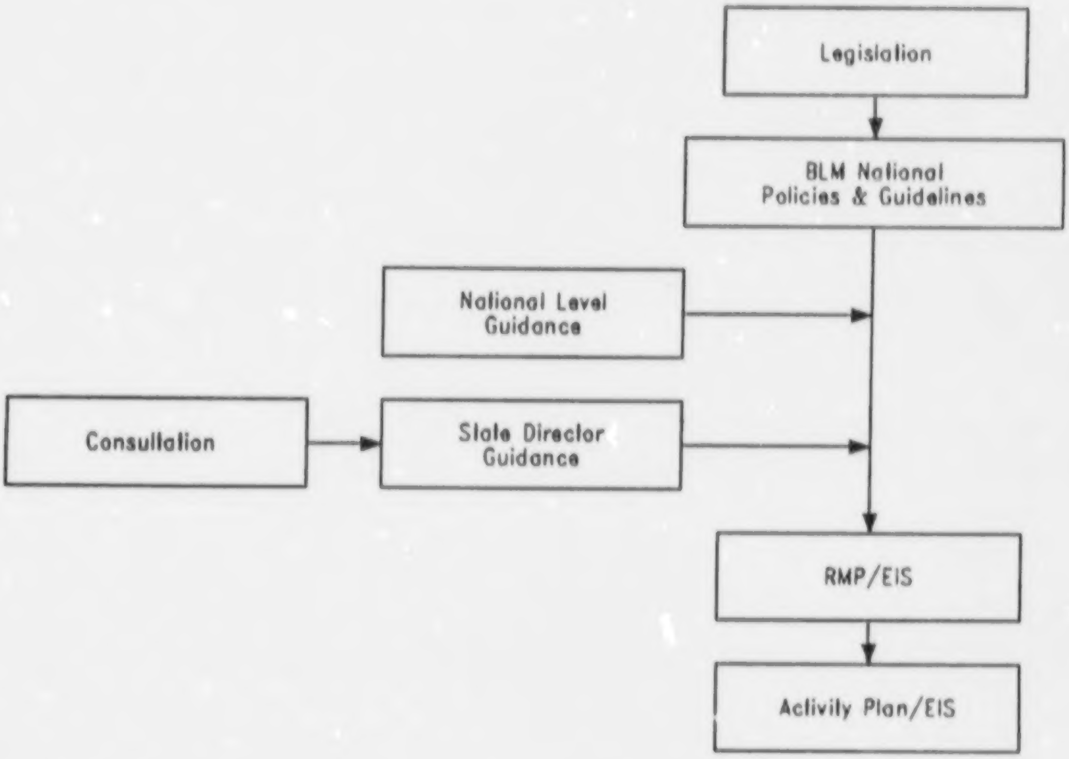
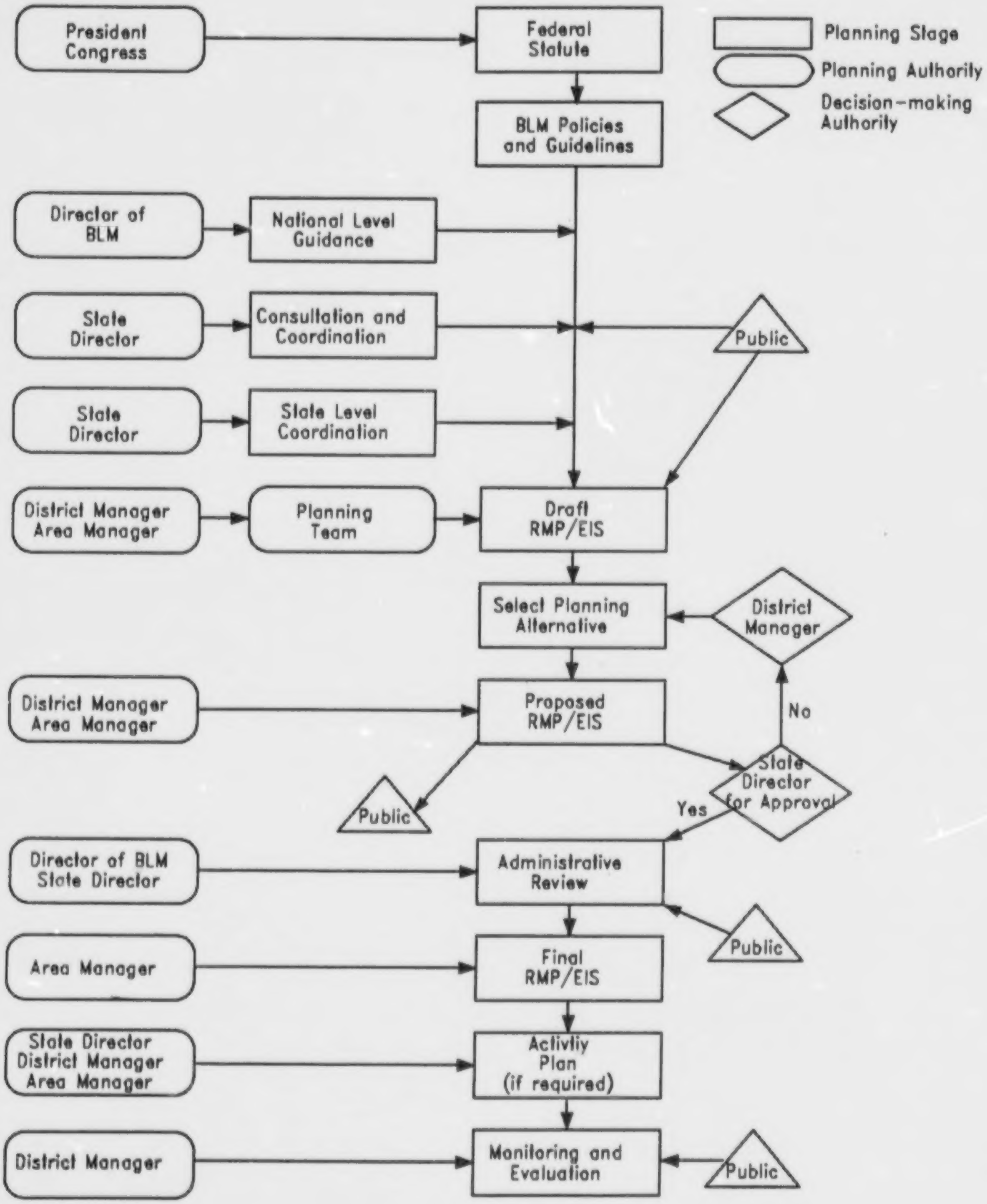

Legislation
BLM National Policies & Guidelines
National Level Guidance
Consultation
State Director Guidance
RMP/EIS
Activity Plan/EIS

Figure 3.41
Planning Process - Bureau of Land Management


President
Congress
Federal
Statute
Planning Stage
Planning Authority
Decision-making
Authority
BLM Policies
and Guidelines
Director of
BLM
National Level
Guidance
State
Director
Consultation and
Coordination
Public
State
Director
State Level
Coordination
District Manager
Area Manager
Planning
Team
Draft
RMP/EIS
Select Planning
Alternative
District
Manager
District Manager
Area Manager
Proposed
RMP/EIS
No
State
Director
for Approval
Yes
Public
Director of BLM
State Director
Administrative
Review
Public
Area Manager
Final
RMP/EIS
State Director
District Manager
Area Manager
Activity
Plan
(if required)
District Manager
Monitoring and
Evaluation
Public

All alternatives are evaluated, compiled and published in a joint draft RMP/EIS. Area Managers and the District Manager identify a preferred management alternative and recommend this alternative to the State Director for approval, publication and filing with the Environmental Protection Agency. After a 120 day review period, comments are used by Area and District Managers to re-evaluate the preferred management alternative. The preferred alternative may be modified, or a new alternative may become the preferred management alternative. The final RMP/EIS is prepared and filed with the State Director. If no protest is filed during the 30 day review period, the State Director may approve the plan. If protests exist, plan approval is delayed until careful consideration of the protest has been undertaken. The process of plan development usually takes 24-30 months.

Activity Plans may also be developed to manage a single resource, or to implement specific RMP decisions. The development of Activity Plans is also issue driven. These plans fully describe priorities, required actions, budgets and time schedules. District Managers are responsible for plan preparation, while State Directors coordinate planning activities. Activity Plans are also subject to NEPA review. If these plans do not conform to the approved RMP, the Activity Plan must be revised or cancelled, or an amendment to the RMP must be scheduled.

It is BLM policy to extend the life of an RMP through strategic revision and amendment to approximately 10 to 15 years. There is no predetermined time frame for RMP review. Instead as new information becomes available, or as resource conflicts develop, RMP amendment is undertaken by re-initiation of the planning process. This is seen to make planning responsive to dynamic change within individual resource areas (see Figure 3.41).

Although there are no provisions to appeal the approval of an RMP, a specific action resulting from implementation of an RMP may be appealed. Initial appeals are to a higher decision maker i.e., State Directors or the Director of BLM; subsequent appeals can be made to the courts on grounds of law or jurisdiction.

Public Participation

FLMPA mandates that public participation occur at these stages within the RMP planning process: the identification of issues, concerns and opportunities; development of planning criteria; selection of the preferred management alternative; and selection of the final RMP. Public interest groups are seen to have considerable impact on the planning process through their ability to contribute planning information and alternative views which the BLM may not have been aware of. Important opportunities for public participation also result from the preparation of a mandatory EIS. At all times the public appears able to act as a watchdog over the planning process. Although selection of the final RMP remains very much an internal decision, the public is invited to question decisions resulting from implementation of the final RMP.

Environmental Impact Assessment

NEPA requires the completion of an EIS for every federal initiative which may have significant impacts on the environment. During the development of RMPs and Activity Plans, it is required that all planning alternatives be evaluated for their potential environmental, biological, economic and social effects. Public participation in the assessment process is required. Unfortunately NEPA does not require an assessment of national BLM policies.

D) PLANNING PRODUCTS

National Level

Policies and guidelines which direct the activities of the BLM are completed at the national level. Since policies and guidelines are non-specific, this allows local flexibility in plan development and resource management.

Resource Area Level

RMPs are developed at the resource area level. These plans define policies, guidelines and regulations for the usage of resources within the resource area.

Activity Plan Level

Activity Plans aid in the management of specific resources, or aid in the implementation of specific management decisions as defined by the RMP. Therefore Activity Plans will define quite specific guidelines and regulations to achieve the desired goal.

3.13 STATE OF ALASKA

Congress granted Alaska statehood in 1959 along with 103.35 million acres (41.8 million hectares) of public state lands, fully one-quarter of the state's total area. By 1989, 63.5% of State lands were covered under 9 Area Plans with 2 additional plans being under development. Large tracts of federal public lands also exist in Alaska. These are managed by the United States Bureau of Land Management. Land use planning undertaken by the Department of Natural Resources(DNR) is not applicable to private, native or federal lands.

A) LEGISLATIVE BASE

Ultimate authority for state lands management rests with the State Legislature through Alaska's Constitution (see Figure 3.42). Specific legislation, especially Statute 38, directs the land planning activities of DNR. Many other laws and regulations such as DNR - Forest Practices Act (AS41.17), DNR - Alaska Water Use Act (AS46.15) and DNR - State Parks Act (AS41) also affect planning and management activities.

B) JURISDICTION AND AUTHORITY

Alaska's Constitution granted responsibility for the administration and management of all public lands and natural resources, on a sustained yield basis, to the State Legislature. This responsibility was passed to the Department of Natural Resources(DNR) through enabling legislation.

The Commissioner of DNR, appointed by the State Legislature, is responsible for all aspects of land use planning on public lands. The Commissioner, directly accountable to the State Legislature, is the final arbitrator for conflicts and approves all plans.

Interdisciplinary planning teams, comprised of representatives from each of DNR's divisions, the Department of Fish and Wildlife, and local and federal governments, are put together to direct the development of specific land use plans. Following the planning team's directives, the Resource Allocation Section of the Division of Land and Water Management of DNR, coordinates planning activities, including public participation, and drafts planning documents. Technical work is undertaken by the appropriate divisions of DNR and other agencies as required.

Provisions exist for the discretionary establishment of an Advisory Board. The Advisory Board has two roles: "elevation" and the solicitation of public input. Elevation is a mechanism for conflict resolution whereby senior officials from conflicting agencies are brought together to resolve disputes arising during the planning process. Solicitation of public input is desirable in cases where, due to cultural barriers to the western planning ideology or low population densities, insufficient public participation in the planning process occurs, or is expected to occur. Local officials or residents are placed on an Advisory Board to petition additional public input and disseminate planning information.

C) PLANNING PROCESS

Planning is undertaken at three levels: State wide, Area and Management Area (see Figures 3.43 and 3.44). State wide planning requires the development of a Plan, which is a statement of broad policy directions and priorities for resource use for both Alaska in general and the individual planning areas within the state. For all practical purposes a State wide Plan has not yet been developed. It is felt that the scale of such a plan would inadequately represent regional and local interests and be ineffective in coordinating resource use within the State.

Statute dictates that Area Plans must be developed prior to allowing certain activities on state public lands. Planning is generally not completed for an area until large scale resource usage is expected. Where specific land allocations must be made, Area Plans are developed. Area Plans are to reflect local needs and state policies for resource use.

Comprehensive membership of relevant interests on the interdisciplinary planning teams is seen to make a referral process unnecessary. After the preparation of a draft Area Plan by the planning team, the plan is reviewed by relevant agencies and the public. Adjustments to the plan are made based on this review. After a thirty day waiting period, the Area Plan is approved by the Commissioner of DNR. There is no mechanism available to appeal the development of Area or Management Area Plans.

An Area Plan takes approximately 2-3 years to prepare, with review undertaken every 5 to 10 years depending on management conflicts and DNR budget constraints and priorities. One year reviews may also be completed were required. Review constitutes a process of recognition of resource issues or conflicts, with solutions being offered through plan amendments. The entire planning process is not re-initiated.

Management Plans may be developed for either smaller areas, or specific resources requiring greater planning detail than afforded by Area Plans. Management Plans detail very specific guidelines for land use activities. For example, all State Forests require Management Plans. The development process for Management Plans parallels the Area Plan planning process.

Areas not under Area Plans are managed according to standard state policies, which have evolved through the development of other Area Plans. Where specific management decisions must be made in unplanned areas, site specific plans are prepared by DNR. The development of these plans essentially mimics the Area Plan planning process except the area of coverage is smaller.

Figure 3.42
Planning Authorities – State of Alaska

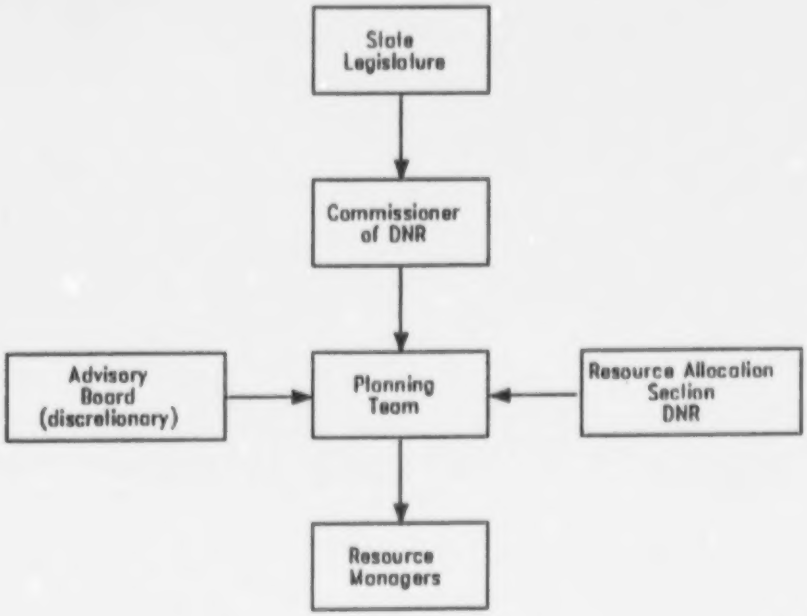

State Legislature
Commissioner of DNR
Advisory Board (discretionary)
Planning Team
Resource Allocation Section DNR
Resource Managers

Figure 3.43
Planning Instruments – State of Alaska

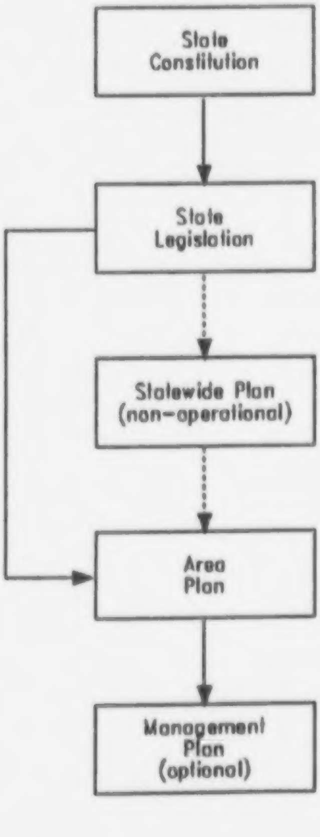
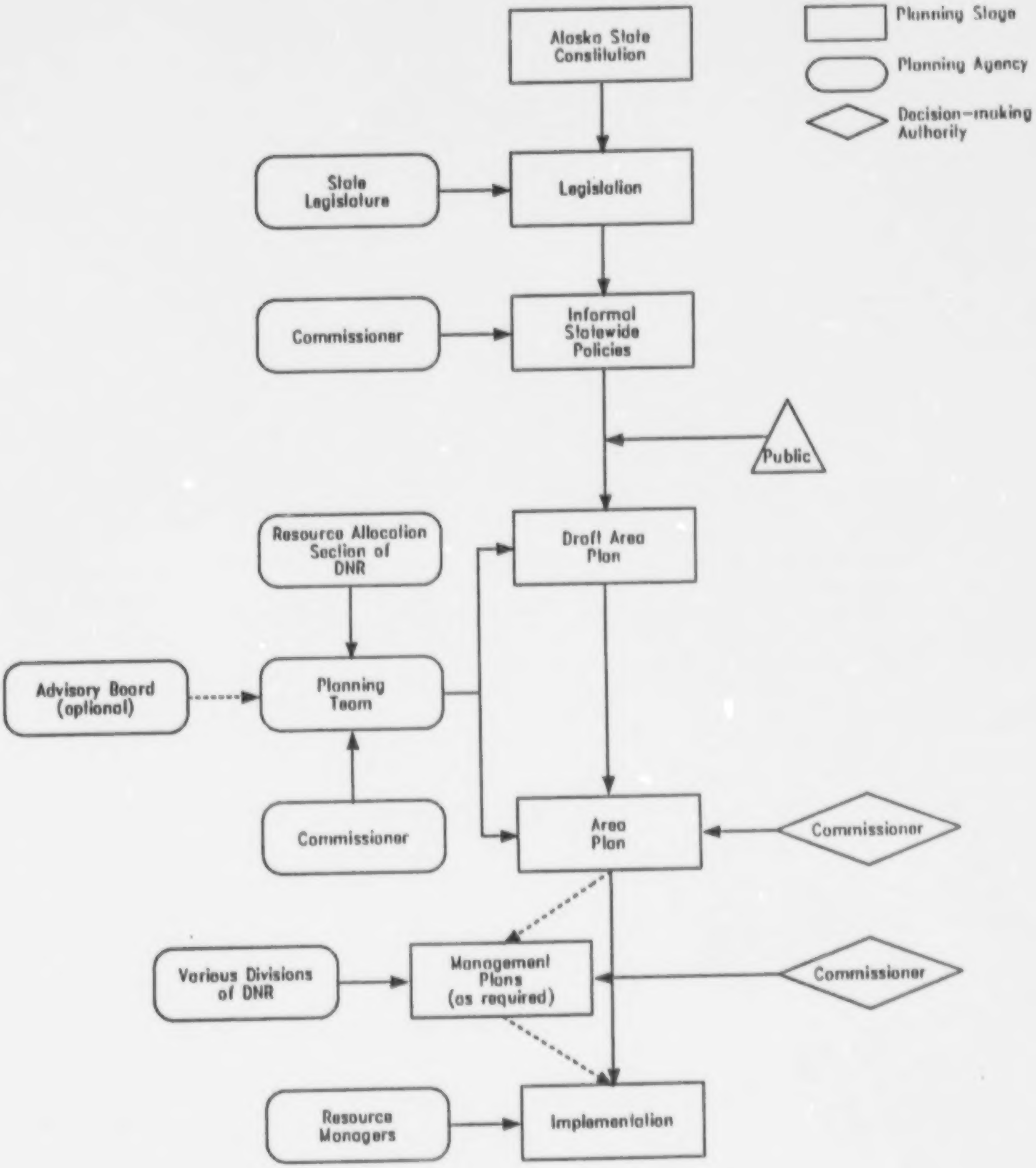

State Constitution
State Legislation
Statewide Plan (non-operational)
Area Plan
Management Plan (optional)

Figure 3.44
Planning Process – State of Alaska



Planning Stage
Planning Agency
Decision-making Authority
Alaska State Constitution
State Legislature
Legislation
Commissioner
Informal Statewide Policies
Public
Resource Allocation Section of DNR
Draft Area Plan
Advisory Board (optional)
Planning Team
Commissioner
Area Plan
Commissioner
Various Divisions of DNR
Management Plans (as required)
Commissioner
Resource Managers
Implementation

Public Participation

Public involvement in the planning process is required by statute. However the nature of this involvement is non-specific. Involvement is seen to evolve from the membership of interest groups on the planning team, and through the solicitation of public input at the following planning stages: initial information gathering; review of proposed management policies and alternatives; review of draft plan; and plan adoption. All public comments and concerns are responded to by the planning team to ensure a measure of accountability.

One drawback to the process is that some individual or interest group concerns may not be adequately represented unless their interests are reflected in the goals of interest groups or agencies represented on the planning team. There is no intervener funding available to assist non-represented interests. A solution to this problem is seen to be the inclusion of a Public Advisory Board during the development of all plans.

Monitoring

Monitoring is seen to be the weakness of this process. Guidelines are enforced through a permitting process, but a lack of monitoring ensures that non-compliance with permits will occur.

Appeals

The conditions of a permit can be appealed to the Commissioner of DNR. Further permit conditions can be appealed to the State courts, but the courts have generally recognized the technical expertise of DNR in the issuance of permits.

Environmental Impact Assessment

There is no formal procedural or legal requirement to complete an environmental assessment for land use plans in Alaska. Background research is completed on all resources prior to plan development. Issues are assessed on an individual basis i.e, if the goal is to dedicate a parcel of land to agriculture, then the impacts of agriculture on that area are determined. The Department of Fish and Wildlife is recognized to be the environmental arm in the planning process. Through their participation it is felt that environmental issues are adequately represented.

D) PLANNING PRODUCTS

Implementation of Area and Management Area Plans is through two products: intent designations and guidelines. Intent designations define the management objective for specific areas. Guidelines outline specific policies and regulations applicable to the management of resources within specific intent designations. It is a legal requirement that all permitting of activities on state public lands be consistent with these intent designations. This mechanism ensures utilization of all plans, consistency in management policy and a measure of administrative accountability.

Planning products come in three final forms:

State Plans:

A State Plan may be developed in the future. Until then no formal state land use policies will exist. Instead a series of informal policies for land use have evolved. When specific policies or guidelines are required for the management of unplanned areas, policies and guidelines proven useful in planned areas are often applied.

Area Plans:

Besides intent designations and associated specific guidelines (see previous section), guidelines delineating specific management goals for the contiguous planning area are also completed.

Management Area Plans:

Since these plans deal with specific resource issues or areas, very specific guidelines and regulations are developed to guide resource use.

3.14 MANITOBA

Crown lands comprise 78% of the land base of Manitoba. All land in the province, except for the City of Winnipeg, is governed by a set of Provincial Land Use Policies (PLUPs) which control the activities of all provincial departments and agencies.

Responsibilities for Crown Land planning are separated between the northern portion of the province and southern "agro-Manitoba" (Figure 3.45). The Crown Land Classification Committee (CLCC) has responsibility for Crown land planning in the south. In the unincorporated areas of northern Manitoba, the Department of Northern Affairs constitutes the local government, but the land is primarily administered by the Department of Natural Resources.

A) LEGISLATIVE BASE

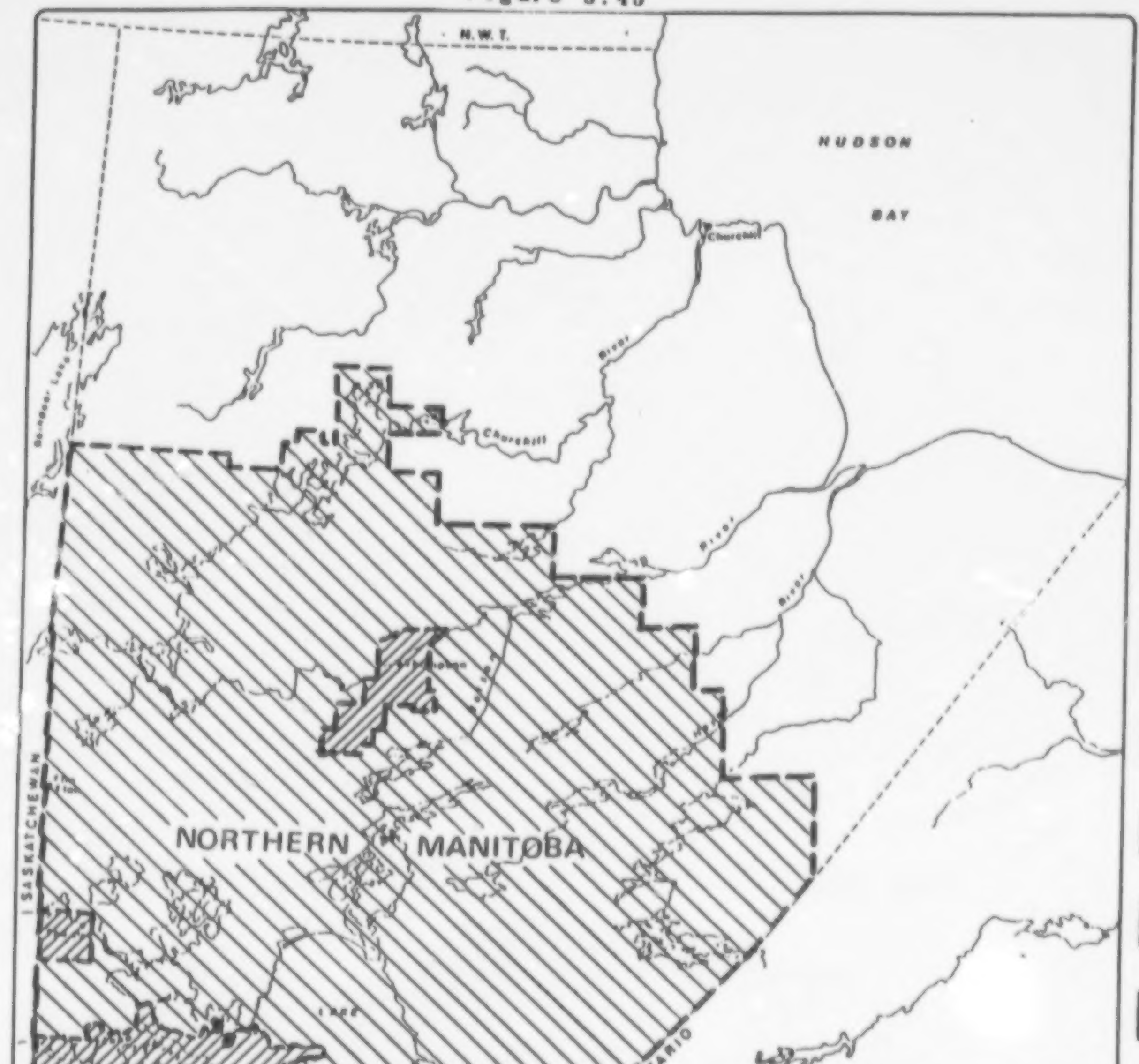
The Planning Act RMS 1987 CP80 sets out the framework for land use policies and land planning in Manitoba. The Crown Lands Act RMS 1987, C340 delineates through a land use classification system the type and intensity of use and the amount of development that can occur on Crown land on a site specific basis. Principal legislative responsibility for Crown lands lies with Manitoba Natural Resources under the Crown Lands Act.

B) JURISDICTION AND AUTHORITY

The Department of Rural Development administers the Planning Act RMS 1987 CP80 in the southern part of the province. Land in the unincorporated areas of northern Manitoba is largely administered by the Department of Natural Resources under the Crown Lands Act RMS 1987, c. C340.

Manitoba Agricultural Crown Lands in the Department of Agriculture issues agricultural leases and permits of occupation or use for those Crown lands which are designated as primarily agricultural lands and multiple use lands which may be used for

Figure 3.45



APPENDIX 5

GEOGRAPHICAL AREA OF CROWN LAND CLASSIFICATION COMMITTEE RESPONSIBILITY.

N.W.T.
HUDSON
BAY
Churchill
Churchill
River
River
River
Reindeer Lake
SASKATCHEWAN
NORTHERN MANITOBA
Lake
Winnipeg
ONTARIO
AGRO-MANITOBA
Winnipeg
U.S.A.
▨ Classification of all Crown Land
▧ Limited Responsibility site specific commercial agricultural requests only

agricultural purposes on an interim or secondary use basis, subject to specific conditions and covenants required by other resource users.

Two branches of the Ministry of Natural Resources are primarily accountable for the allocation of Crown lands. The Lands Branch is responsible for the administration and management of Crown lands and the Resource Integration Branch (RIB) develops and implements allocation policy and planning.

The organizational structure for land use planning in Manitoba is designed to:

1. Coordinate and expedite the planning effort at the provincial level.
2. Provide leadership by stating its own policies and priorities regarding land use.
3. Protect provincial interests and investments.

Planning authorities that have been established include the Provincial Land Use Committee of Cabinet (PLUC), the Interdepartmental Planning Board (IPB) and the Crown Land Classification Committee (CLCC). The IPB is a statutory body of Deputy Ministers or equivalent level government officials appointed under the Planning Act. The CLCC, a subcommittee of the PLUC, is comprised of senior agency officials. (Figure 3.46).

Minister of Rural Development - This Minister is the elected official responsible for general land use policy and program coordination.

Provincial Land Use Committee (PLUC) - Cabinet Ministers, normally representing resource related departments, make up this committee. Members are appointed by Order-in-Council and presently include the Ministers of Agriculture, Northern Affairs, Environment, Rural Development, Natural Resources, Highways and Transportation, and Energy and Mines. The committee serves as a senior coordinating mechanism for the development and recommendation of land use policy proposals, projects and legislation.

The committee has a number of functions:

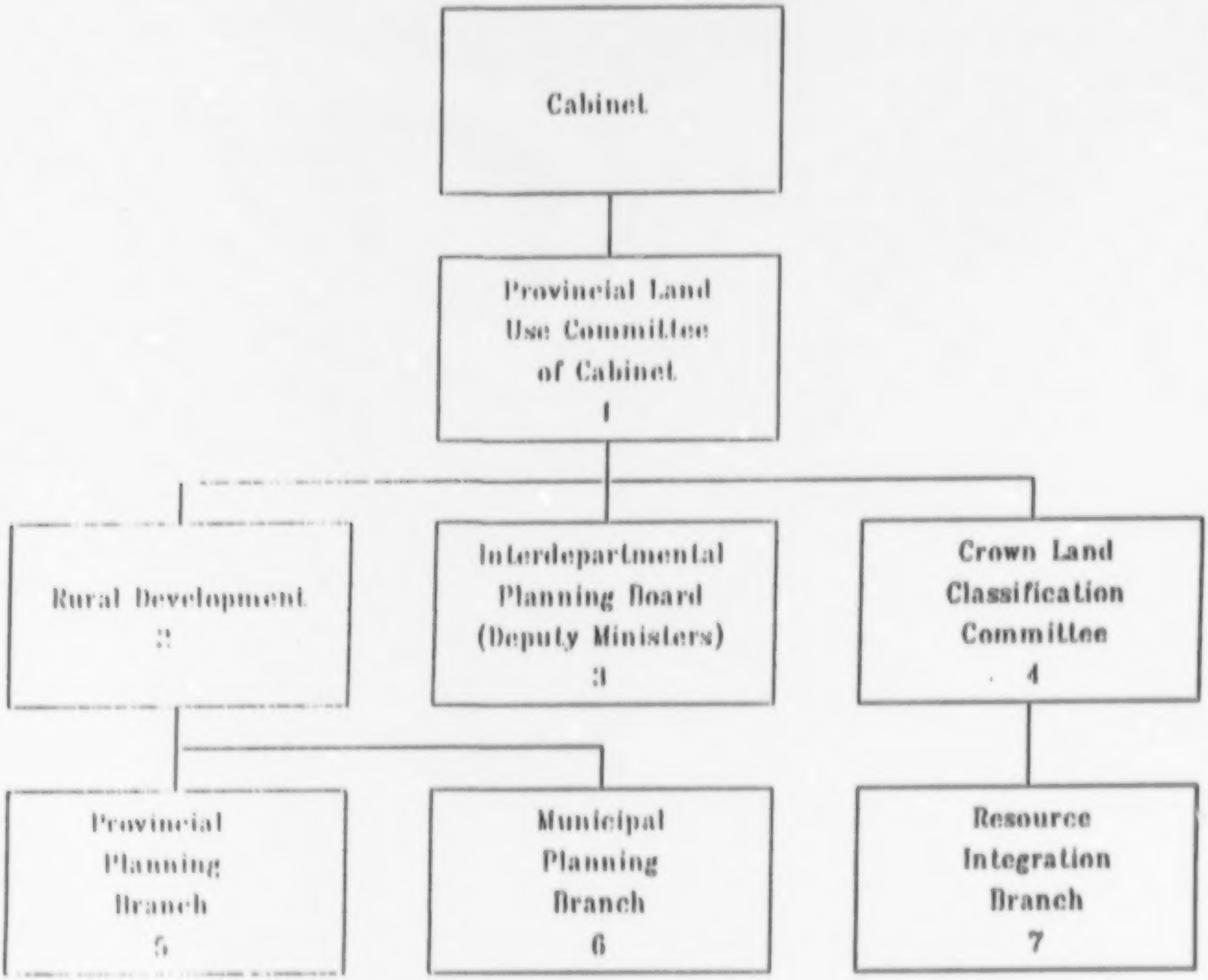
1. To establish and revise Provincial Land Use Policies.
2. To resolve land use issues involving more than one department.
3. To assess the land use/environmental impacts of some major projects.
4. To advise the Minister of Rural Development on certain approvals.
5. The supervision of both the IPB and the CLCC.

Interdepartmental Planning Board (IPB) - The IPB is a statutory body appointed under the Planning Act. Members are Deputy Ministers or equivalent level from all government departments having a significant interest in land and are appointed by Order-in-Council. The IPB is a forum for interagency review of land use policies, programs and proposals for recommendation to the Provincial Land Use Committee. The board also provides a single point of contact for municipalities or developers who are developing plans which involve provincial approval or review.

Crown Land Classification Committee (CLCC) - The CLCC (Figure 3.47) is a subcommittee of the Provincial Land Use Committee of Cabinet with responsibilities for Crown land planning in southern Manitoba, Agricultural Crown land sales and Crown land exchanges. The committee reports to and receives its direction from the PLUC. There are nine regular members: three from Natural Resources; two from Agriculture; and one from each of Rural Development, Northern Affairs, Energy & Mines and Environment. The general composition of the committee has been established by the PLUC, with the specific

Figure 3.46 Manitoba

Provincial Land Policy and Administration in Manitoba

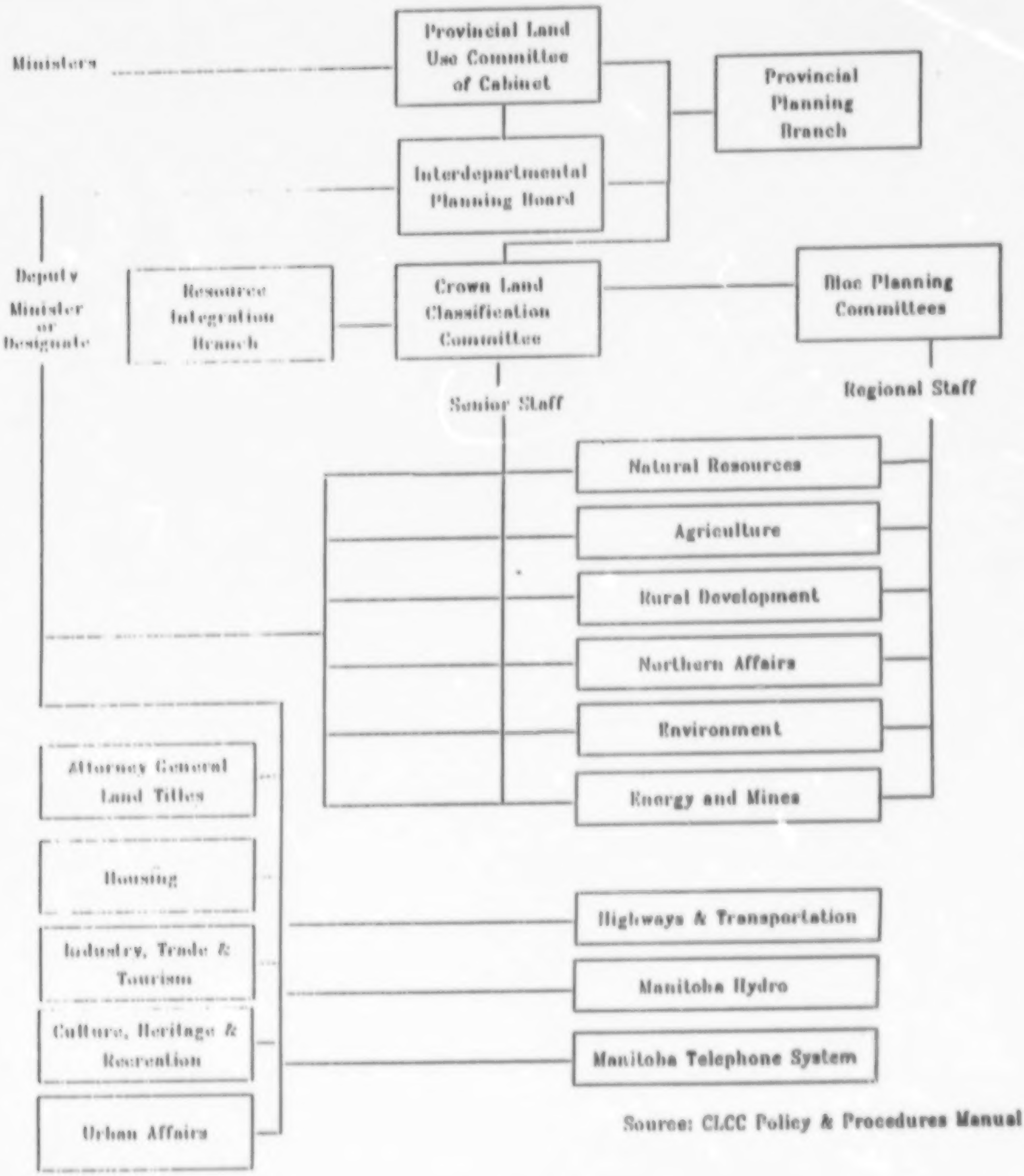

Cabinet
Provincial Land Use Committee of Cabinet
1
Rural Development
2
Interdepartmental Planning Board (Deputy Ministers)
3
Crown Land Classification Committee
4
Provincial Planning Branch
5
Municipal Planning Branch
6
Resource Integration Branch
7

1. Responsible for Provincial Land Use Policies (PLUP's)
2. Responsible for the administration of PLUP's
3. Responsible for interdepartmental coordination
4. Responsible for planning Crown land within municipalities
5. Provides staff support to the Minister, the Provinical Land Use Committee and the Interdepartmental Planning Board
6. Oversees and supports local planning
7. Provides staff support to Crown Land Classification Committee

Source: Richardson 1989

Figure 3.47 Manitoba Planning Authority

Organizational Chart
Crown Land Classification Committee
Southern Crown Land Planning Program


Ministers
Provincial Land Use Committee of Cabinet
Provincial Planning Branch
Interdepartmental Planning Board
Deputy Minister or Designate
Resource Integration Branch
Crown Land Classification Committee
Bloc Planning Committees
Senior Staff
Regional Staff
Natural Resources
Agriculture
Rural Development
Northern Affairs
Environment
Energy and Mines
Attorney General Land Titles
Housing
Industry, Trade & Tourism
Culture, Heritage & Recreation
Urban Affairs
Highways & Transportation
Manitoba Hydro
Manitoba Telephone System

Source: CLCC Policy & Procedures Manual

committee members appointed by their respective departments. Chair and Vice-chair of the CLCC are elected by the committee.

The CLCC is responsible for preparation and review of both Interdepartmental Operational Crown Land Plans (Operational Plans) and Provincial Crown Land Plans (Provincial Plans). The committee also reviews any major designation of Crown land to use (i.e. Provincial Forest, Wildlife Management Area, Community Pasture, Provincial Park) in southern Manitoba.

Block Planning Committees (BPCs) - BPCs have been established by the CLCC to expedite Crown land planning at the regional level. The eight BPCs are composed of regional specialists from the departments represented on the CLCC. Block Planning Committees are responsible for providing field land use recommendations and representing the CLCC in each region.

Manitoba Natural Resources - The Resource Integration Branch of this government department provides the CLCC with its planning, management and support staff including a general operating budget.

Ministry of Rural Development - The Provincial Planning Branch of this department provides staff support to the PLUC of Cabinet and the IPB and the Municipal Planning Branch supports local planning.

C) PLANNING PROCESS

All land in Manitoba, except for the City of Winnipeg, is governed by a set of Provincial Land Use Policies (PLUPs) which control the activities of all provincial departments and agencies. Manitoba is the only province aside from Quebec to have established such a comprehensive, province-wide and integrated system of land use policy.

The Crown Land Classification Committee (CLCC) has responsibility for Crown land planning in southern Manitoba. This is undertaken through an Interdepartmental Operational Planning Process. In 1976, the CLCC established a regional planning structure which included eight local Block Planning Committees (BPCs), directly responsible to the CLCC. In 1978, the CLCC became a subcommittee of the Provincial Land Use Committee of Cabinet (PLUC) with added responsibilities for Agricultural Crown land sales and Crown land exchanges.

The CLCC was given a mandate by the PLUC to ensure a consultative review of Crown land classification maps with local councils. This led to the establishment of a revised Crown land planning process. In this process, Provincial Crown Land Use Classification Plans are initiated by the CLCC, reviewed by local planning boards and councils and by IPB members, then approved by the PLUC.

A series of approval and review procedures for both Provincial and Operational Crown Land Plans have been outlined under Crown Land Classification Committee policy and procedures.

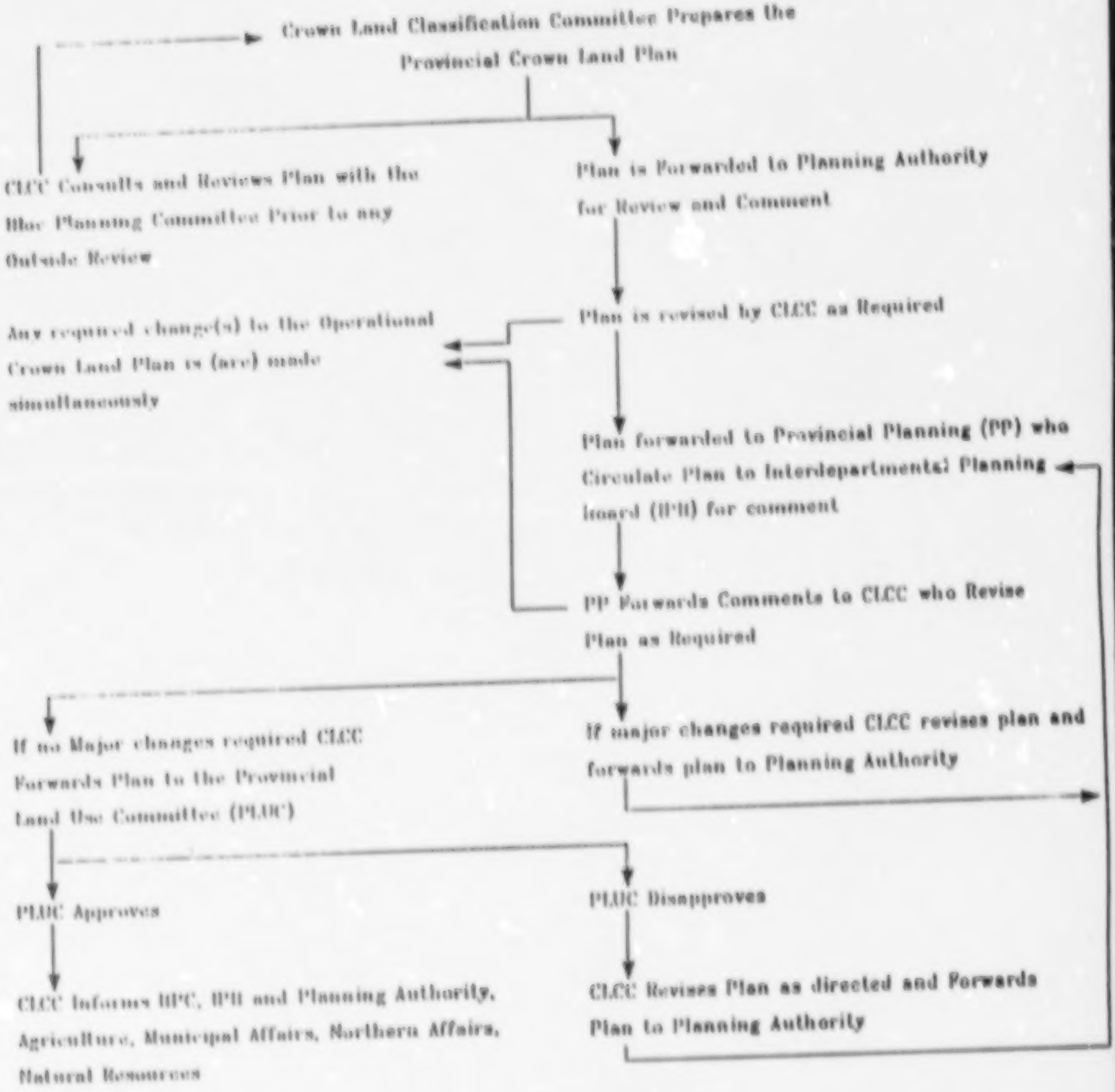
These processes are shown in Figures 3.48 - 3.52.

Figure 3.48 - Approval procedure for Provincial Crown Land Plan where no Development Plan exists. CLCC Policy and Procedures pg 86.

Figure 3.49 - Approval procedure for Provincial Crown Land Plan where a Development Plan is being prepared. CLCC Policy and Procedures pg 85.

Figure 3.48 Manitoba

Approval Procedure for Provincial Crown Land Plan
Where No Development Plan Exists



Crown Land Classification Committee Prepares the Provincial Crown Land Plan

CLCC Consults and Reviews Plan with the Bloc Planning Committee Prior to any Outside Review

Plan is Forwarded to Planning Authority for Review and Comment

Plan is revised by CLCC as Required

Any required change(s) to the Operational Crown Land Plan is (are) made simultaneously

Plan forwarded to Provincial Planning (PP) who Circulate Plan to Interdepartmental Planning board (IPB) for comment

PP Forwards Comments to CLCC who Revise Plan as Required

If no Major changes required CLCC Forwards Plan to the Provincial Land Use Committee (PLUC)

If major changes required CLCC revises plan and forwards plan to Planning Authority

PLUC Approves

PLUC Disapproves

CLCC Informs BPC, IPB and Planning Authority, Agriculture, Municipal Affairs, Northern Affairs, Natural Resources

CLCC Revises Plan as directed and Forwards Plan to Planning Authority

Source: CLCC Policy & Procedures Manual

Figure 3.49
Approval Procedure for Provincial Crown Land Plan and Amendments: Where a Development Plan is Being Prepared.

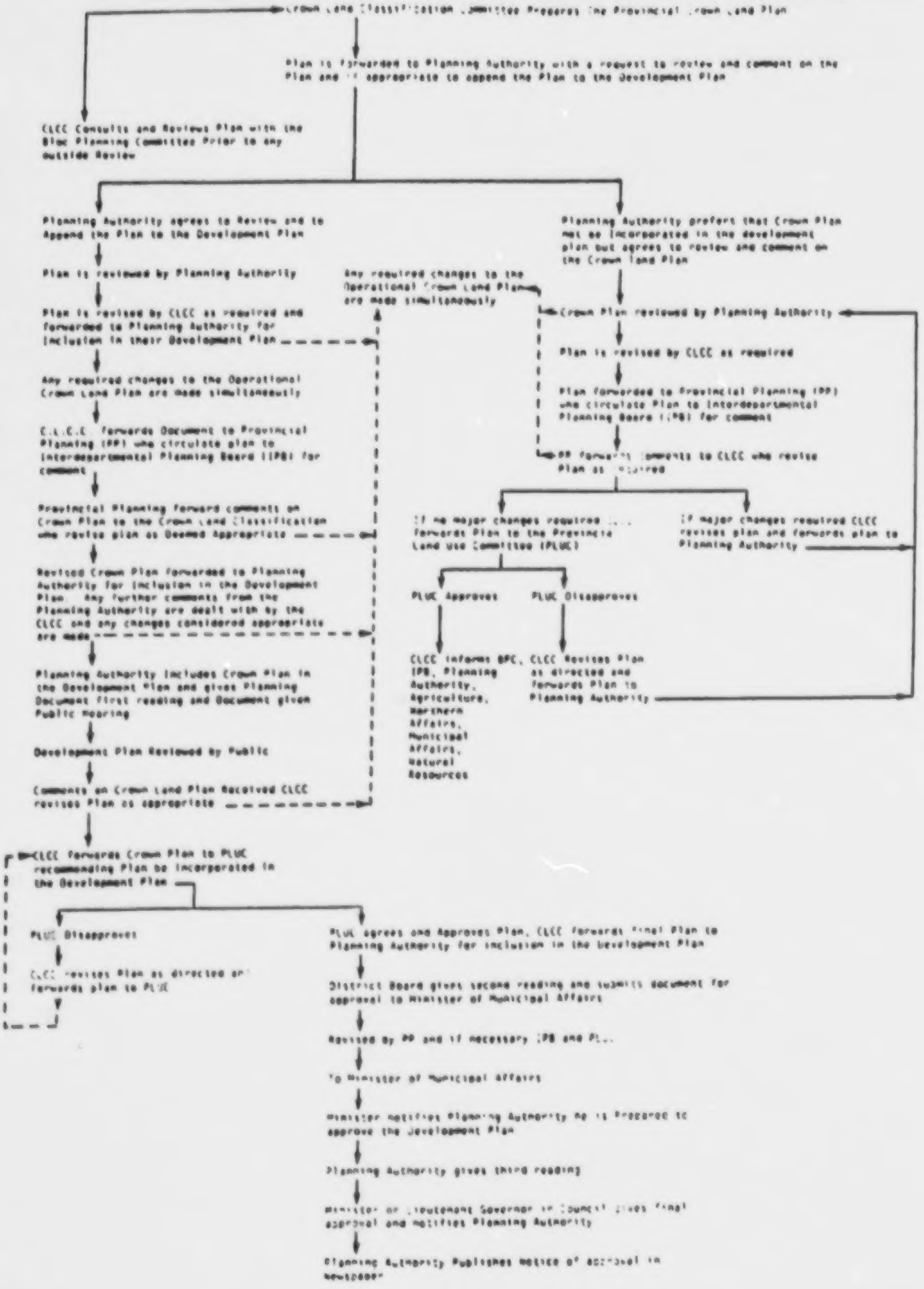
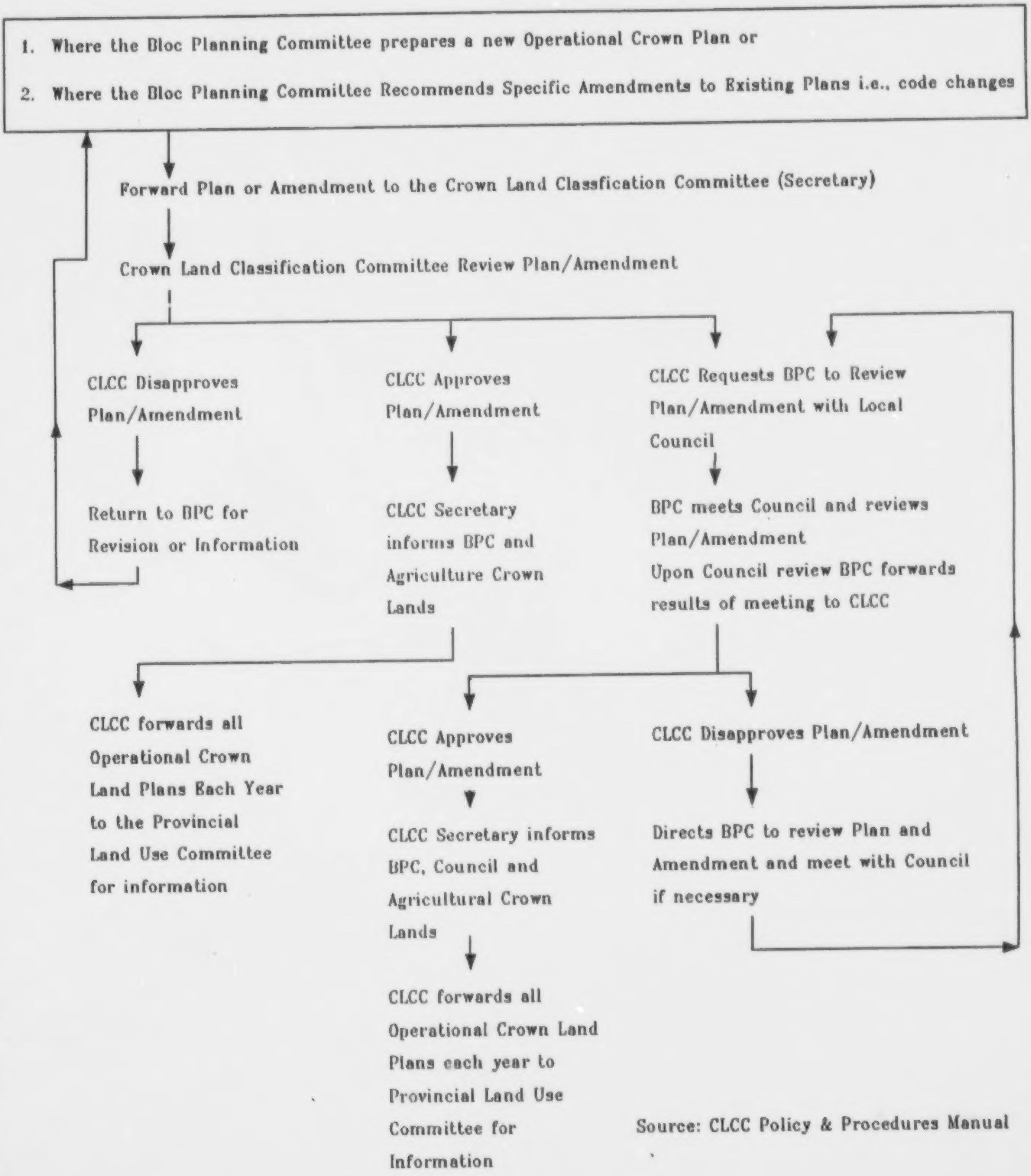

Crown Land Classification Committee Prepares the Provincial Crown Land Plan
Plan is forwarded to Planning Authority with a request to review and comment on the Plan and if appropriate to append the Plan to the Development Plan
CLCC Consults and Reviews Plan with the Bloc Planning Committee Prior to any outside Review
Planning Authority agrees to Review and to Append the Plan to the Development Plan
Plan is reviewed by Planning Authority
Plan is revised by CLCC as required and forwarded to Planning Authority for Inclusion in their Development Plan
Any required changes to the Operational Crown Land Plan are made simultaneously
C.L.C.C. forwards Document to Provincial Planning (PP) who circulate plan to Interdepartmental Planning Board (IPB) for comment
Provincial Planning forward comments on Crown Plan to the Crown Land Classification who revise plan as Deemed Appropriate
Revised Crown Plan forwarded to Planning Authority for Inclusion in the Development Plan. Any further comments from the Planning Authority are dealt with by the CLCC and any changes considered appropriate are made
Planning Authority Includes Crown Plan in the Development Plan and gives Planning Document first reading and Document given Public Hearing
Development Plan Reviewed by Public
Comments on Crown Land Plan Received CLCC revises Plan as appropriate
CLCC Forwards Crown Plan to PLUC recommending Plan be incorporated in the Development Plan
PLUC Disapproves
CLCC revises Plan as directed and forwards plan to PLUC
PLUC agrees and Approves Plan, CLCC forwards final Plan to Planning Authority for inclusion in the Development Plan
District Board gives second reading and submits document for approval to Minister of Municipal Affairs
Revised by PP and if necessary IPB and PLUC
To Minister of Municipal Affairs
Minister notifies Planning Authority he is Prepared to approve the Development Plan
Planning Authority gives third reading
Minister or Lieutenant Governor in Council gives final approval and notifies Planning Authority
Planning Authority Publishes notice of approval in newspaper
Planning Authority prefers that Crown Plan not be Incorporated in the development plan but agrees to review and comment on the Crown land Plan
Any required changes to the Operational Crown Land Plan are made simultaneously
Crown Plan reviewed by Planning Authority
Plan is revised by CLCC as required
Plan forwarded to Provincial Planning (PP) who circulate Plan to Interdepartmental Planning Board (IPB) for comment
PP forwards comments to CLCC who revise Plan as required
If no major changes required CLCC forwards Plan to the Provincial Land Use Committee (PLUC)
If major changes required CLCC revises plan and forwards plan to Planning Authority
PLUC Approves
PLUC Disapproves
CLCC informs BPC, IPB, Planning Authority, Agriculture, Northern Affairs, Municipal Affairs, Natural Resources
CLCC Revises Plan as directed and forwards Plan to Planning Authority

Figure 3.50 Manitoba



1. Where the Bloc Planning Committee prepares a new Operational Crown Plan or
2. Where the Bloc Planning Committee Recommends Specific Amendments to Existing Plans i.e., code changes

Forward Plan or Amendment to the Crown Land Classfication Committee (Secretary)

Crown Land Classification Committee Review Plan/Amendment

CLCC Disapproves Plan/Amendment

Return to BPC for Revision or Information

CLCC Approves Plan/Amendment

CLCC Secretary informs BPC and Agriculture Crown Lands

CLCC forwards all Operational Crown Land Plans Each Year to the Provincial Land Use Committee for information

CLCC Requests BPC to Review Plan/Amendment with Local Council

BPC meets Council and reviews Plan/Amendment
Upon Council review BPC forwards results of meeting to CLCC

CLCC Approves Plan/Amendment

CLCC Secretary informs BPC, Council and Agricultural Crown Lands

CLCC forwards all Operational Crown Land Plans each year to Provincial Land Use Committee for Information

CLCC Disapproves Plan/Amendment

Directs BPC to review Plan and Amendment and meet with Council if necessary

Source: CLCC Policy & Procedures Manual

Figure 3.51
Review and Approval Procedures for Proposed Wildife Management Areas

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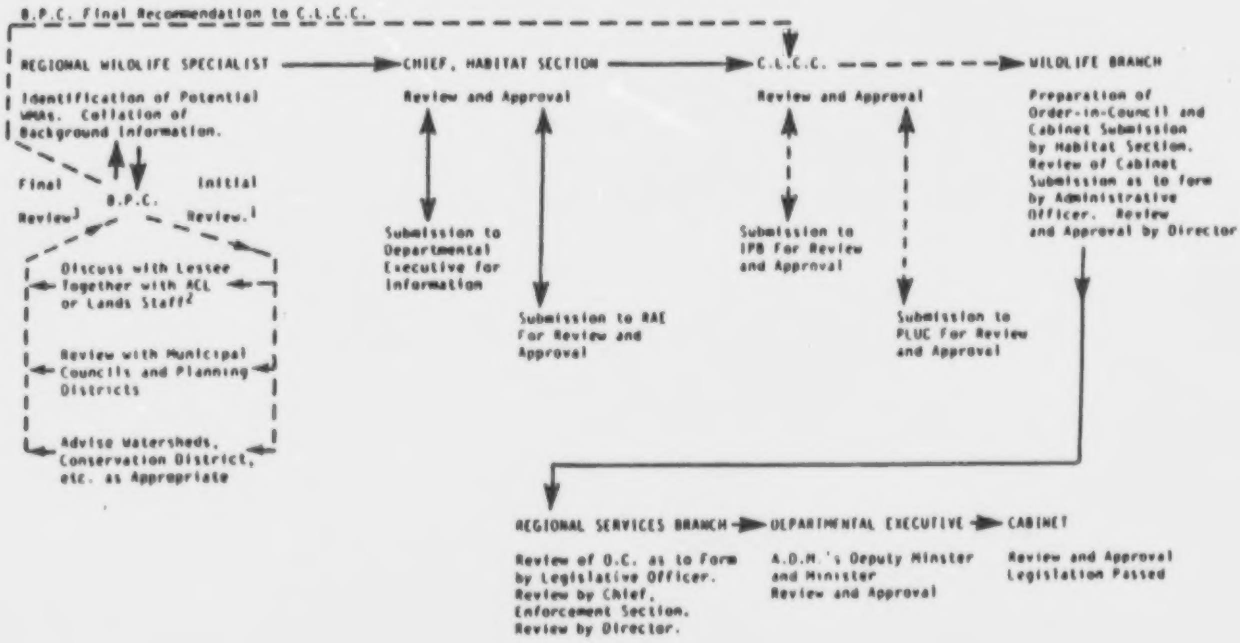
WILDLIFE MANAGEMENT AREA APPROVAL PROCESS

NOTE: Dotted Lines Indicate C.L.C.C. Process

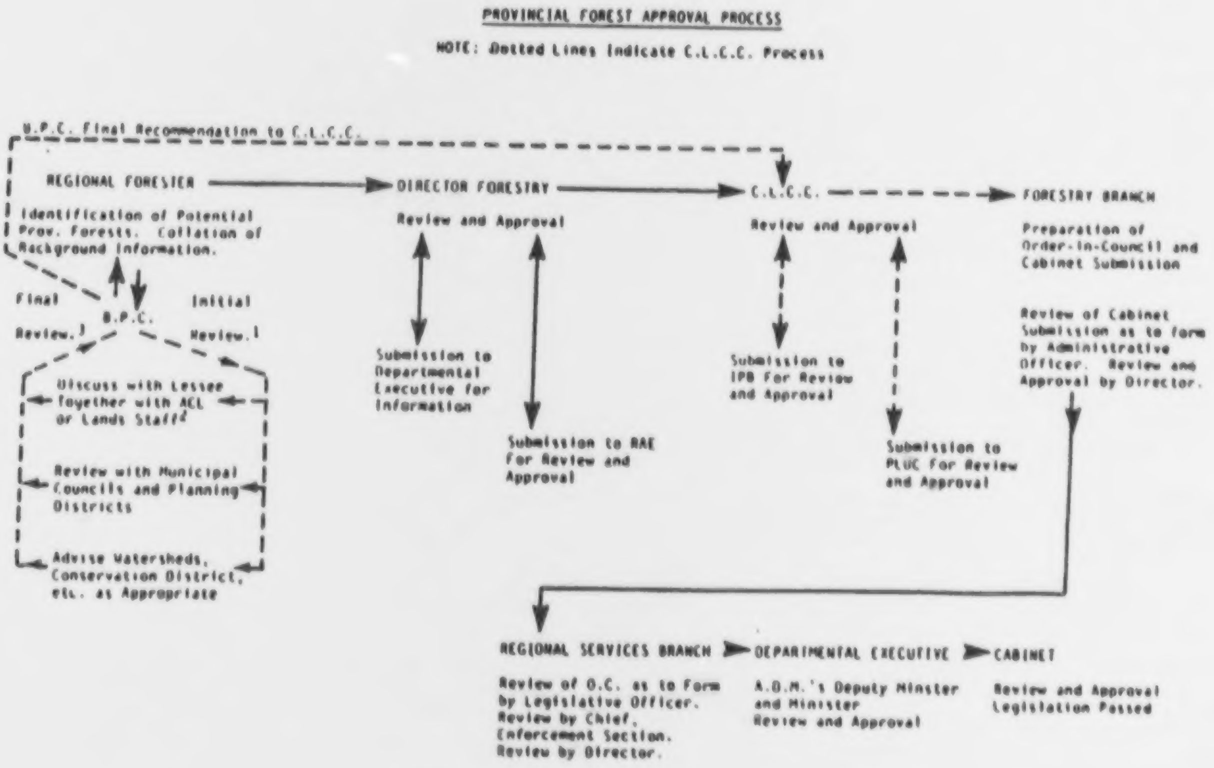

B.P.C. Final Recommendation to C.L.C.C.
REGIONAL WILDLIFE SPECIALIST
Identification of Potential WMAs. Collation of Background Information.
Final Review[3]
B.P.C.
Initial Review.[1]
Discuss with Lessee Together with ACL or Lands Staff[2]
Review with Municipal Councils and Planning Districts
Advise Watersheds, Conservation District, etc. as Appropriate
CHIEF, HABITAT SECTION
Review and Approval
Submission to Departmental Executive for Information
Submission to RAE For Review and Approval
C.L.C.C.
Review and Approval
Submission to IPB For Review and Approval
Submission to PLUC For Review and Approval
WILDLIFE BRANCH
Preparation of Order-in-Council and Cabinet Submission by Habitat Section. Review of Cabinet Submission as to form by Administrative Officer. Review and Approval by Director
REGIONAL SERVICES BRANCH
Review of O.C. as to Form by Legislative Officer. Review by Chief, Enforcement Section. Review by Director.
DEPARTMENTAL EXECUTIVE
A.D.M.'s Deputy Minster and Minister Review and Approval
CABINET
Review and Approval Legislation Passed

[1] If BPC does not support proposal, CLCC will decide on further action; i.e. CLCC may direct that BPC present the issue to local government for comment. Those issues relating to Policy will be forwarded to PLUC for direction by CLCC.

If BPC does support proposal, chairman will advise (in writing) Municipal Councils, Planning Districts, Watersheds and Conservation Districts, etc. of the proposal and indicate that appropriate resource staff will be contacting them to arrange a review meeting.

[2] Initial contact with lessee will be made by appropriate staff representing lessor. Lessor will be responsible for scheduling a meeting between REGIONAL WILDLIFE SPECIALIST, lessee, and lessor to inform lessee of the proposal and implications, if any, to his operations, etc.

Figure 3.52
Review and Approval Procedures for Proposed Provincial Forests


PROVINCIAL FOREST APPROVAL PROCESS
NOTE: Dotted Lines Indicate C.L.C.C. Process
B.P.C. Final Recommendation to C.L.C.C.
REGIONAL FORESTER
Identification of Potential Prov. Forests. Collation of Background Information.
Final Review.[3]
B.P.C.
Initial Review.[1]
Discuss with Lessee Together with ACL or Lands Staff[2]
Review with Municipal Councils and Planning Districts
Advise Watersheds, Conservation District, etc. as Appropriate
DIRECTOR FORESTRY
Review and Approval
Submission to Departmental Executive for Information
Submission to RAE For Review and Approval
C.L.C.C.
Review and Approval
Submission to IPB For Review and Approval
Submission to PLUC For Review and Approval
FORESTRY BRANCH
Preparation of Order-In-Council and Cabinet Submission
Review of Cabinet Submission as to form by Administrative Officer. Review and Approval by Director.
REGIONAL SERVICES BRANCH
Review of O.C. as to Form by Legislative Officer. Review by Chief, Enforcement Section. Review by Director.
DEPARIMENTAL EXECUTIVE
A.D.M.'s Deputy Minster and Minister Review and Approval
CABINET
Review and Approval Legislation Passed

[1] If BPC does not support proposal, CLCC will decide on further action; i.e. CLCC may direct that BPC present the issue to local government for comment. Those issues relating to Policy will be forwarded to PLUC for direction by CLCC.

If BPC does support proposal, chairman will advise (in writing) Municipal Councils, Planning Districts, Watersheds and Conservation Districts, etc. of the proposal and indicate that appropriate resource staff will be contacting them to arrange a review meeting.

[2] Initial contact with lessee will be made by appropriate staff representing lessor. Lessor will be responsible for scheduling a meeting between REGIONAL FORESTER lessee, and lessor to inform lessee of the proposal and implications, if any, to his operations

Figure 3.50 - Approval procedure for Operational Crown Land Plans where no Provincial Plan exists. CLCC Policy and Procedures pg 90.

Figure 3.51 - Review and approval procedures for proposed Wildlife Management Areas. CLCC ToR pg 32.

Figure 3.52 - Review and approval procedures for proposed Provincial Forests. CLCC ToR pg 33.

For Northern Manitoba the planning program for Crown lands is administered by the Forestry Branch of the Department of Natural Resources. Northern Crown land plans are essentially overviews, allocating the land and water base to resource-oriented uses such as industrial development, outdoor recreation and wildlife production according to departmental priorities and the department's perception of public and private demands. In 1989 a process to develop a Sustainable Development Plan was initiated specific to the proposed Repap forestry project in northern Manitoba.

Once approved by the Minister of Natural Resources these plans are presented to the Inter-departmental Planning Board so that the broader government perspective may be incorporated into the plan. Such incorporation may be either through the development of a government plan which includes the Department of Natural Resources plan as one component or through revisions to the natural resources plan at the request of other departments. The Planning Board has a central role in both approaches since it acts as coordinator for inter-departmental review and input into northern Crown land plans.

Environmental impact assessment

Figure 3.53 - Manitoba Environment Act flowchart.

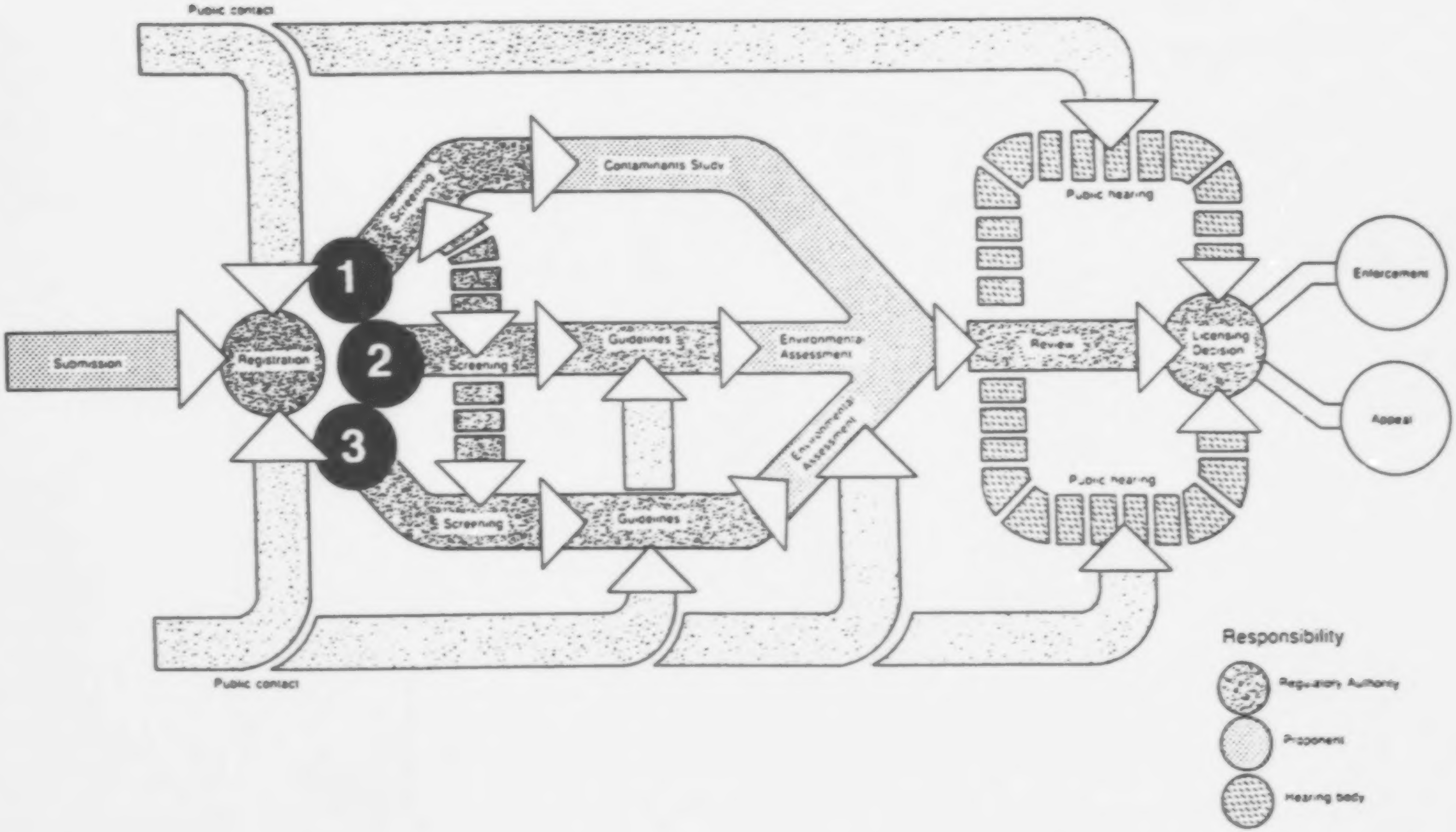
Environment assessment in Manitoba is an element in an overall process created by the Environment Act RSM 1987-88 C26. The Act binds the Crown and agents of the Crown. The Minister of Environment may exempt a development or class of developments from the process when the development is considered to be subject to an approval process that assures the involvement of interested government departments and of a meaningful role for the public. Exemption is made by agreement between the Minister of Environment and the minister responsible for the alternative process. The Minister of Environment may require a further review of developments when specific environmental issues are determined.

A development is considered to be any project, industry, operation or activity, or any alteration or expansion of any of these that may emit a pollutant, or have potentially adverse impact on the natural environment or directly related effects on social, economic, health or cultural well-being of people or a community.

A number of government officials and committees are involved in the assessment process. The Director of Environmental Control reports to the Deputy Minister of Environment and is responsible for coordination of the process. The Director makes various process decisions: the level and nature of environmental study needed; whether public hearings are held; and granting or refusal of a licence. The Interdepartmental Planning Board is a body of Deputy Ministers or their designates that reports to the Land Use Committee of Cabinet regarding proposals which require provincial approval or review. A Technical Assessment Committee is appointed by the Interdepartmental Planning Board to advise the proponent, review the assessment, and report recommendations to the Director for a decision. The Clean Environment Commission is appointed by Cabinet, with the Chairperson reporting to the Minister. Upon the Minister's request, the commission holds public meetings or hearings or acts as a mediator in

Figure 3.53

MANITOBA ENVIRONMENT ACT
FLOW CHART


Public contact
Submission
Registration
1
2
3
Screening
Screening
Screening
Contaminants Study
Guidelines
Guidelines
Environmental Assessment
Environmental Assessment
Review
Public hearing
Public hearing
Licensing Decision
Enforcement
Appeal
Public contact
Responsibility
Regulatory Authority
Proponent
Hearing body

environmental disputes. The commission members have the protection and powers of commissioners under the Manitoba Evidence Act RSM 1987 E/50.

The Environment Act provides for licensing procedures for three specified classes of developments defined in regulation that vary according to the nature, severity and magnitude of their potential impacts. Class 1 developments are limited to those that may involve pollution. Class 2 developments include not only the potential for pollution, but involve a wider range of environmental impacts requiring assessment. Class 3 developments are major projects with a very large potential for complex impacts.

D) PLANNING PRODUCTS

Figure 3.54 - Planning Structure diagram, Policy and Procedures Manual page 5 of 5.

The provincial framework for Crown land planning in Manitoba is set out in the terms of reference to the Crown Land Classification Committee. The committee is required to maintain two major planning processes. As mentioned above, these are:

1. A Provincial Crown Land Planning Process.

2. An Interdepartmental Operational Planning Process.

Each process has a Crown land plan as its end product. The provincial process results in a Provincial Crown Land Plan (Provincial Plan). The interdepartmental process leads to an Interdepartmental Operational Crown Land Plan (Operational Plan). The basic characteristics of the two processes are outlined in Figure 3.54.

3.15 NEW BRUNSWICK

Crown lands in New Brunswick total 45% of the land base. The majority of these lands are under the jurisdiction and administration of the Minister of Natural Resources. The department primarily delegates management of Crown lands to licensees through Forest Management Agreements on specific areas of land.

A) LEGISLATIVE BASE

The principal piece of legislation affecting the management of New Brunswick Crown lands is the Crown Lands and Forests Act R.S.N.B. 1982 c.38.1.

The Crown Lands and Forests Act evolved from a process involving the Deputy Minister's Committee on Economic Development. In 1981, the committee appointed a subcommittee which established a Land Use Policy Task Force to recommend a land use policy for the province. This led to the new legislation on Crown lands..

Basic Characteristics of The Two Planning Processes

Figure 3.54

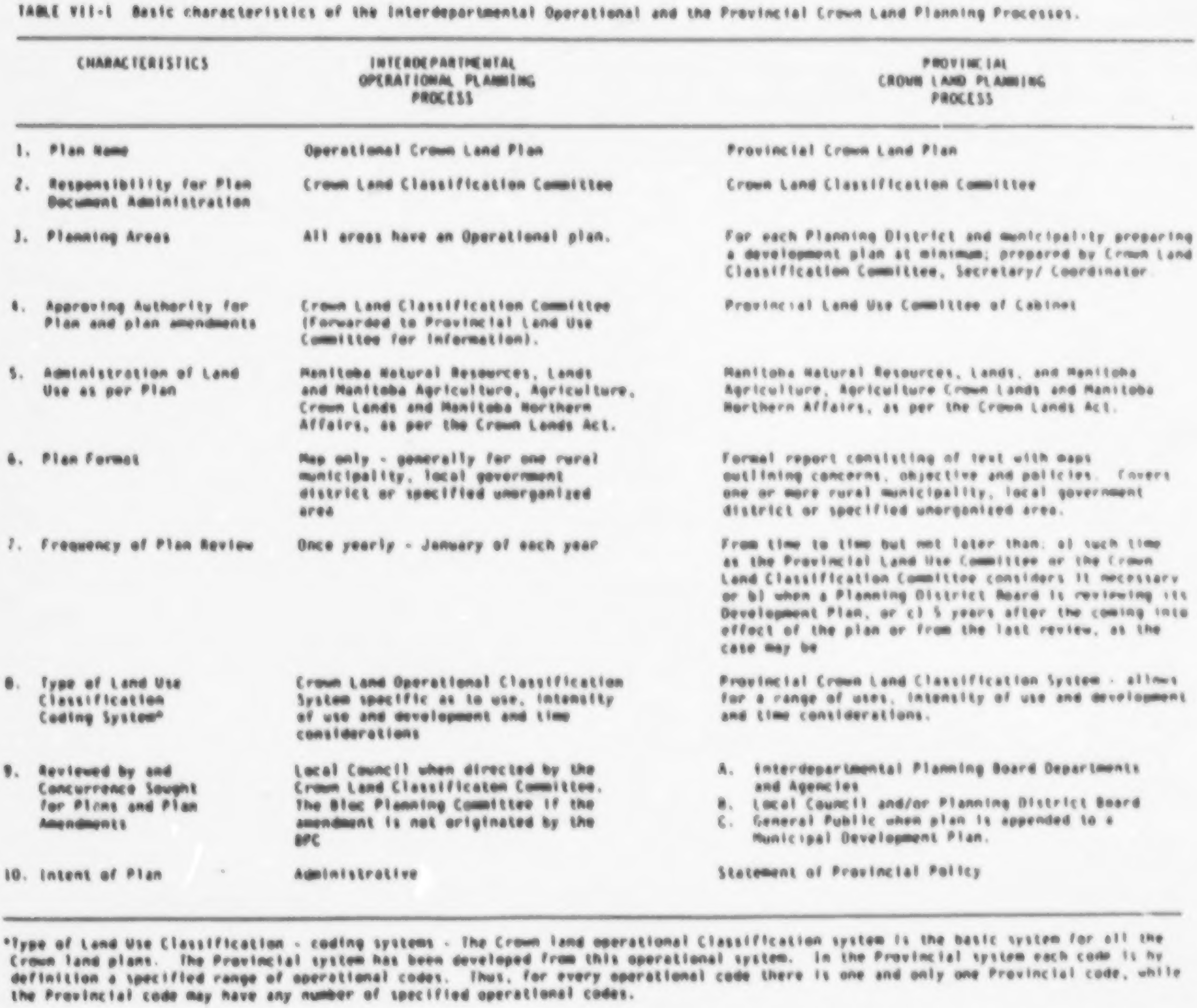


TABLE VII-1 Basic characteristics of the Interdepartmental Operational and the Provincial Crown Land Planning Processes.

CHARACTERISTICS	INTERDEPARTMENTAL OPERATIONAL PLANNING PROCESS	PROVINCIAL CROWN LAND PLANNING PROCESS
1. Plan Name	Operational Crown Land Plan	Provincial Crown Land Plan
2. Responsibility for Plan Document Administration	Crown Land Classification Committee	Crown Land Classification Committee
3. Planning Areas	All areas have an Operational plan.	For each Planning District and municipality preparing a development plan at minimum; prepared by Crown Land Classification Committee, Secretary/ Coordinator
4. Approving Authority for Plan and plan amendments	Crown Land Classification Committee (Forwarded to Provincial Land Use Committee for information).	Provincial Land Use Committee of Cabinet
5. Administration of Land Use as per Plan	Manitoba Natural Resources, Lands and Manitoba Agriculture, Agriculture, Crown Lands and Manitoba Northern Affairs, as per the Crown Lands Act.	Manitoba Natural Resources, Lands, and Manitoba Agriculture, Agriculture Crown Lands and Manitoba Northern Affairs, as per the Crown Lands Act.
6. Plan Format	Map only - generally for one rural municipality, local government district or specified unorganized area	Formal report consisting of text with maps outlining concerns, objective and policies. Covers one or more rural municipality, local government district or specified unorganized area.
7. Frequency of Plan Review	Once yearly - January of each year	From time to time but not later than: a) such time as the Provincial Land Use Committee or the Crown Land Classification Committee considers it necessary or b) when a Planning District Board is reviewing its Development Plan, or c) 5 years after the coming into effect of the plan or from the last review, as the case may be
8. Type of Land Use Classification Coding System*	Crown Land Operational Classification System specific as to use, intensity of use and development and time considerations	Provincial Crown Land Classification System - allows for a range of uses, intensity of use and development and time considerations.
9. Reviewed by and Concurrence Sought for Plans and Plan Amendments	Local Council when directed by the Crown Land Classificaton Committee. The Bloc Planning Committee if the amendment is not originated by the BPC	A. Interdepartmental Planning Board Departments and Agencies B. Local Council and/or Planning District Board C. General Public when plan is appended to a Municipal Development Plan.
10. Intent of Plan	Administrative	Statement of Provincial Policy

*Type of Land Use Classification - coding systems - The Crown land operational Classification system is the basic system for all the Crown land plans. The Provincial system has been developed from this operational system. In the Provincial system each code is by definition a specified range of operational codes. Thus, for every operational code there is one and only one Provincial code, while the Provincial code may have any number of specified operational codes.

B) JURISDICTION AND AUTHORITY

Figure 3.55 - Planning Framework, Environment Canada Working Paper 28, pg 69.

The Department of Natural Resources (DNR) is the major authority responsible for administering Crown lands in the province. It delegates management of Crown lands to licensees primarily through Forest Management Agreements. Other government departments with legal authority to administer provincial lands include: Supply and Services; Agriculture and Rural Development; Tourism; Transportation; Commerce and Development; Education; Health; Municipal Affairs; and Justice.

All transactions involving a lease agreement are reviewed by the interdepartmental Land Management Advisory Committee (LMAC). The committee members include representatives of the following departments: Tourism; Environment; Transportation; and the Mineral Development Branch, the Forest Extension Branch, the Fish and Wildlife Branch and a regional agent of the DNR. The committee is chaired by the Crown Lands Branch of DNR with recommendations from the LMAC forwarded to the Director of Crown Lands through the Land Management Section of the branch. If a proposal is approved at this level, a memorandum is submitted to Cabinet for final approval.

The Community Planning Act R.S.N.B. 1973 c. H-12 provides the institutional framework for the municipal development of lands through the Department of Municipal Affairs. The Act sets up several planning agencies:

- a District Planning Commission;
- an advisory committee for municipalities not in a planning district; and
- a provincial Planning Committee.

C) PLANNING PROCESS

Figures 3.56 and 3.57 - Regional and Municipal Plan Approval Processes Environment Canada Working Paper 28 pg 64.

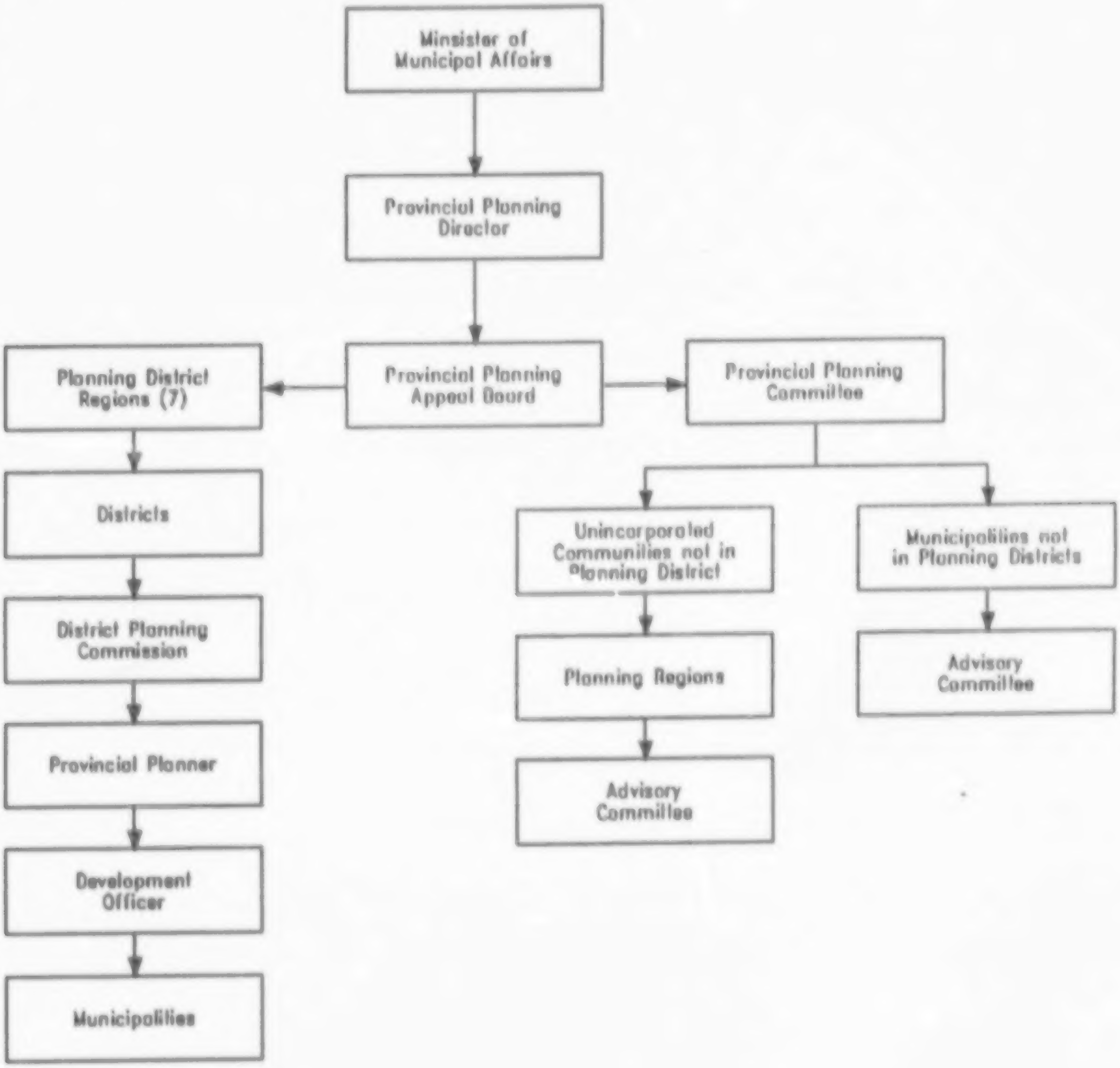
The processes for approving Regional and Municipal Plans are shown in Figures 3.56 and 3.57. Under the Community Planning Act, the province is divided into seven planning regions. Each region contains municipalities and unincorporated areas that are combined to form a planning district (Figure 3.58). At the district level, the Minister of Municipal Affairs is responsible for preparing a Regional Plan which sets out the planning policies for a region.

Figure 3.59 outlines the operational planning process for approval of Crown land acquisition, disposal and lease applications. Applications are reviewed both at the regional level and subsequently by the Land Management Section of the Crown Lands Branch, DNR. Within the Land Management Section, each application is reviewed by members of the department Land Use Committee. This committee only convenes if the proposed transaction involves a complex situation or previous consensus on the matter cannot be reached.

All transactions involving a lease agreement are reviewed by the interdepartmental Land Advisory Committee. This committee meets on a monthly basis and is chaired by the Crown Lands Branch of DNR. A recommendation on all land transactions under the Crown Lands and Forests Act is made to the Director of Crown

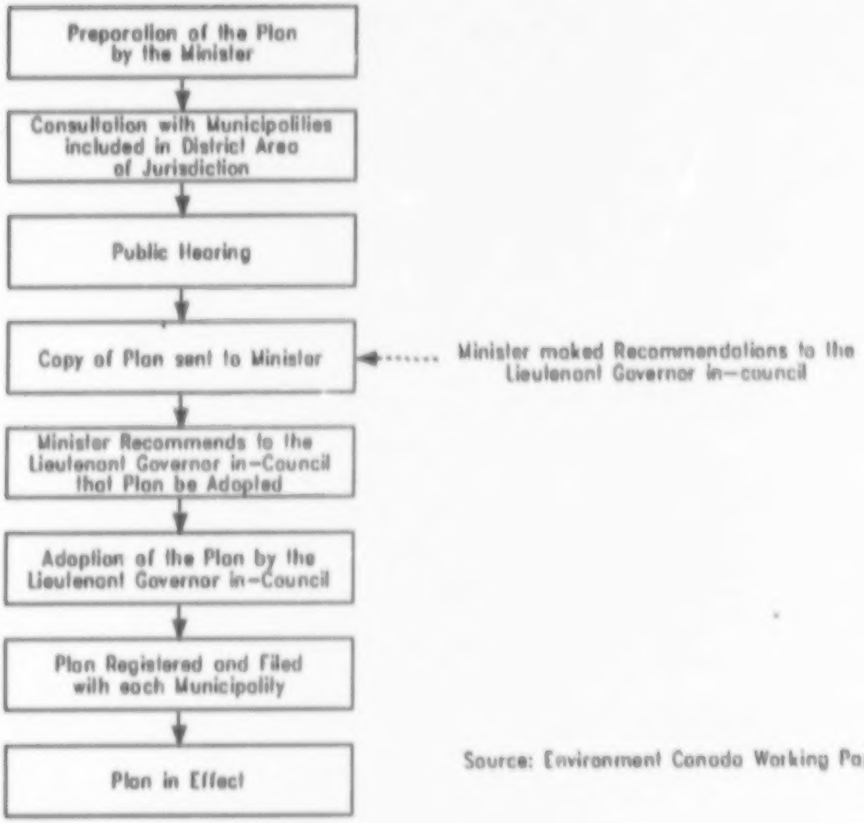
Figure 3.55: New Brunswick

Municipal Planning Framework


Minsister of Municipal Affairs
Provincial Planning Director
Provincial Planning Appeal Board
Planning District Regions (7)
Provincial Planning Committee
Districts
Unincorporated Communities not in Planning District
Municipalities not in Planning Districts
District Planning Commission
Planning Regions
Advisory Committee
Provincial Planner
Advisory Committee
Development Officer
Municipalities

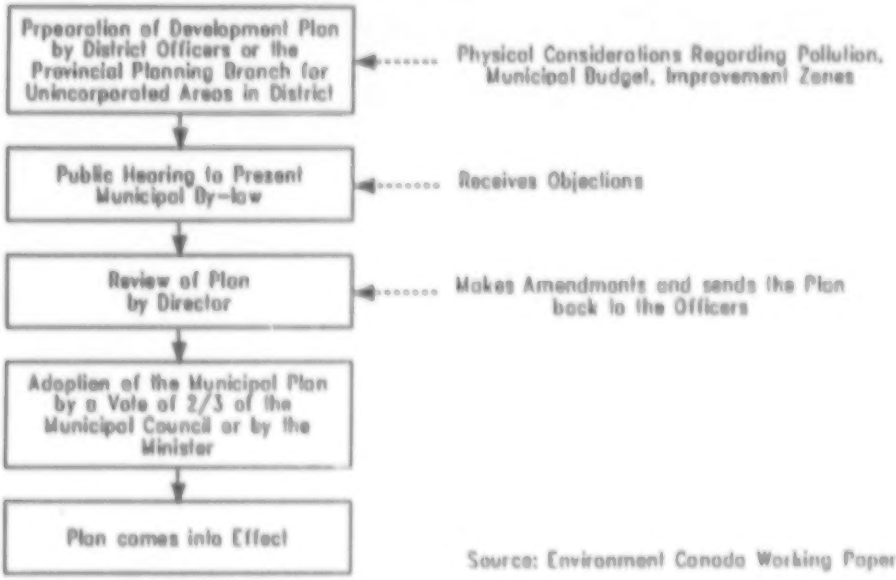
Source: V.Crommer. 1975. Land Use Programs in Canada, New Brunswick

Figure 3.56: New Brunswick
Regional Plan Approval Process – New Brunswick


Preparation of the Plan by the Minister
Consultation with Municipalities included in District Area of Jurisdiction
Public Hearing
Copy of Plan sent to Minister
Minister makes Recommendations to the Lieutenant Governor in-council
Minister Recommends to the Lieutenant Governor in-Council that Plan be Adopted
Adoption of the Plan by the Lieutenant Governor in-Council
Plan Registered and Filed with each Municipality
Plan in Effect

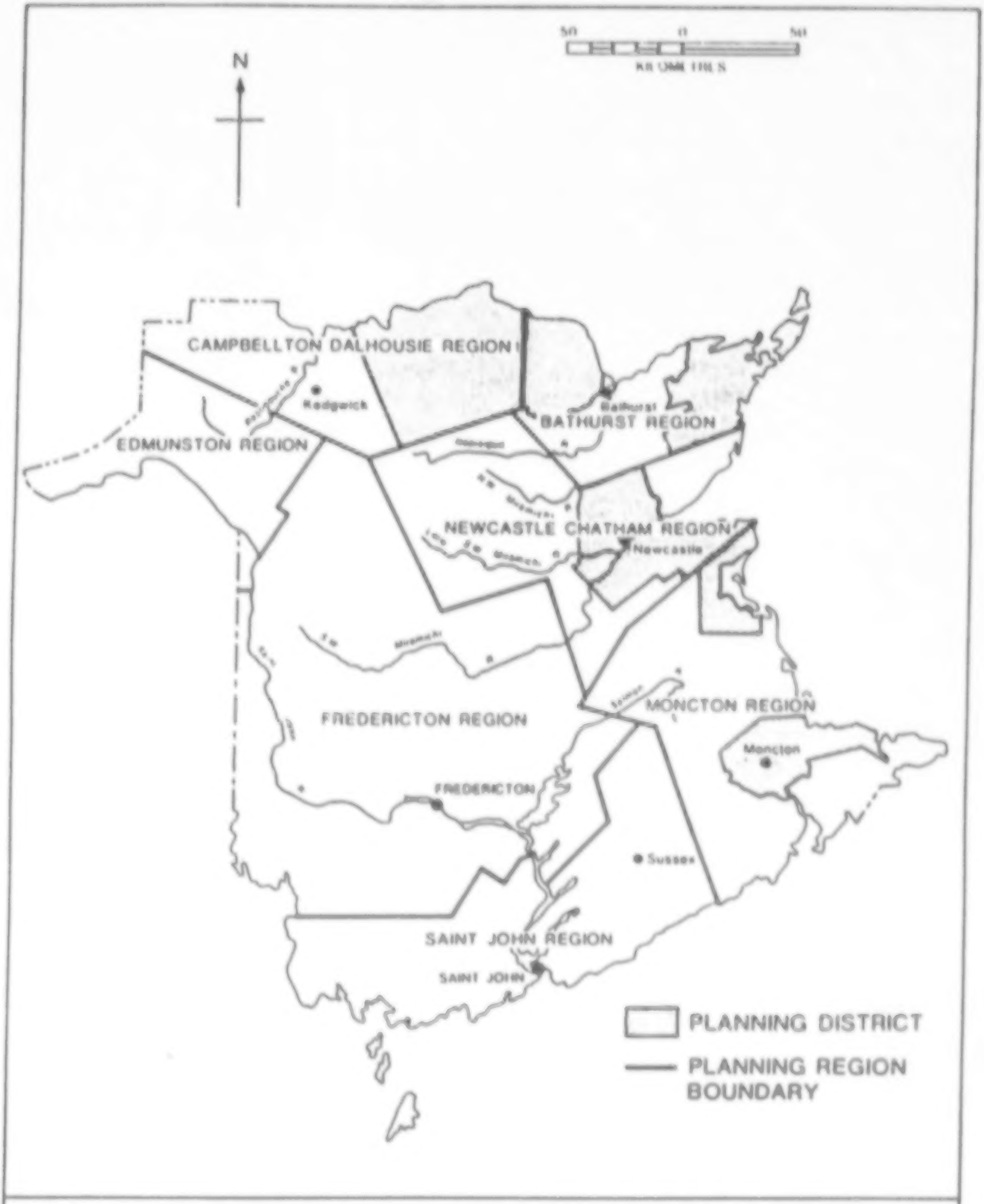
Source: Environment Canada Working Paper 28

Figure 3.57: New Brunswick
Municipal Plan/Basic Planning Statement Approval Process


Prpearation of Development Plan by District Officers or the Provincial Planning Branch for Unincorporated Areas in District
Physical Considerations Regarding Pollution, Municipal Budget, Improvement Zones
Public Hearing to Present Municipal By-law
Receives Objections
Review of Plan by Director
Makes Amendments and sends the Plan back to the Officers
Adoption of the Municipal Plan by a Vote of 2/3 of the Municipal Council or by the Minister
Plan comes into Effect

Source: Environment Canada Working Paper 28

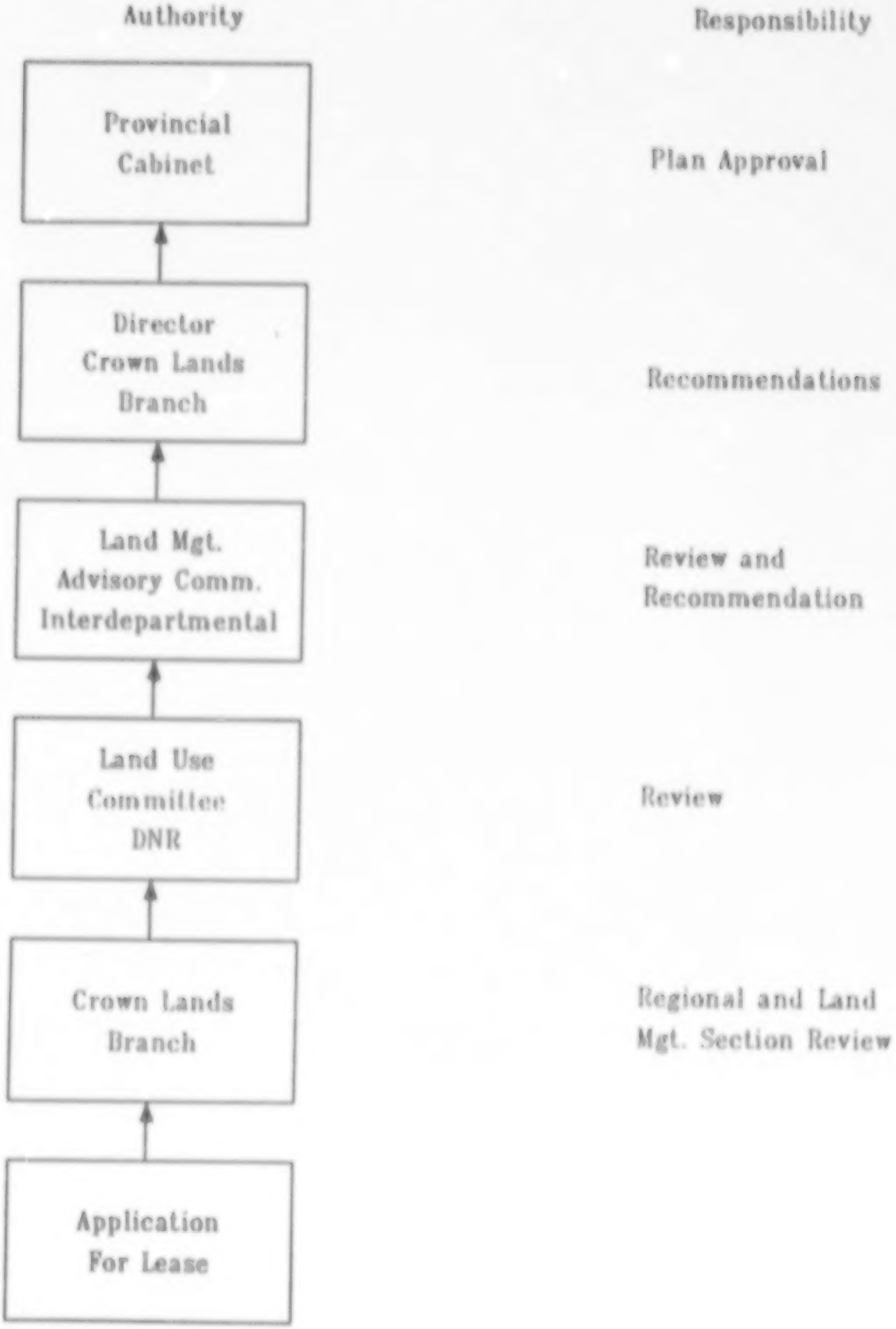
Figure 3.58


50 0 50
KILOMETRES
N
CAMPBELLTON DALHOUSIE REGION
Kedgwick
Bathurst
BATHURST REGION
EDMUNSTON REGION
NEWCASTLE CHATHAM REGION
Newcastle
MONCTON REGION
Moncton
FREDERICTON REGION
FREDERICTON
Sussex
SAINT JOHN REGION
SAINT JOHN
PLANNING DISTRICT
PLANNING REGION BOUNDARY

MAP 3: PLANNING REGIONS AND PLANNING DISTRICTS IN NEW BRUNSWICK

Source: Community planning Branch, Department of Municipal Affairs, Province of New Brunswick
Rev. Feb. 1982

New Brunswick - Figure 3.59
Operational Planning Process under the Crown Lands and Forest Act
New Brunswick


Authority
Responsibility
Provincial Cabinet
Plan Approval
Director Crown Lands Branch
Recommendations
Land Mgt. Advisory Comm. Interdepartmental
Review and Recommendation
Land Use Committee DNR
Review
Crown Lands Branch
Regional and Land Mgt. Section Review
Application For Lease

Lands by the Land Management Section. If a proposal is approved at this level, a memorandum is submitted to Cabinet for final approval.

Public Involvement

Public input regarding the use of Crown lands is sought on an informal basis through such groups as maple sugar producers, private woodlot owners, Christmas tree producers and agricultural groups.

Environmental impact assessment

Figure 3.60 - EIA Process.

The New Brunswick environmental impact assessment process derives its authority from the Clean Environment Act and the pursuant Environmental Impact Assessment Regulation (87-83; July 13, 1987). The Act and Regulation bind the Crown.

The EIA Regulation is administered by the Environmental Assessment and Planning Section of the Department of Municipal Affairs and Environment. The Minister of Municipal Affairs and Environment may appoint a Review Committee consisting of specialists from provincial agencies; representatives from federal, municipal or regional agencies; and members of the public. The Minister assigns the committee its duties which include the formulation of guidelines, review of EIA Reports and advising the Minister.

D) PLANNING PRODUCTS

Figure 3.58 - Planning Regions and Planning Districts Environment Canada Working Paper 28 pg 67.

The primary objective of the Crown Lands and Forests Act is the integrated management of the resources on Crown land. The dominant means used to meet this objective are Forest Management Agreements (FMAs) with individual Crown timber license holders. Under FMAs, the Department of Natural Resources assesses the performance of licensees relative to set standards for forest resource management activities.

The Community Planning Act contains provisions for Regional and Municipal Plans. Figure 3.58 outlines the boundaries of planning regions and districts. Figures 3.56 and 3.57 outline the approval process for Regional and Municipal Plans.

3.16 NEWFOUNDLAND

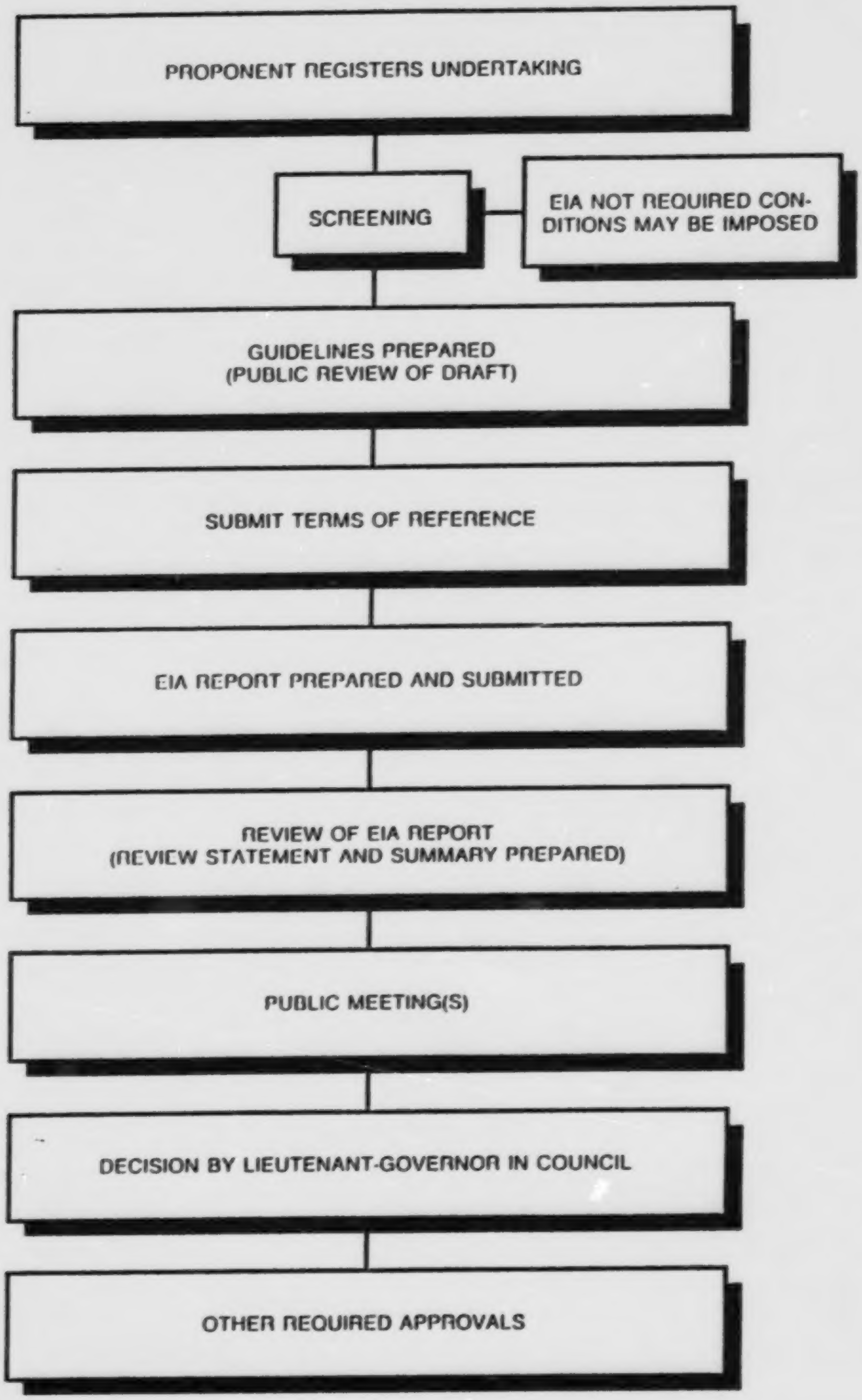
Newfoundland, unlike many other provinces, is not organized into counties or planning districts. The boundaries for Regional Crown Land planning areas are initially determined by the Lands Branch of the provincial Department of Environment and Lands. These tentative boundaries are then forwarded to the Interdepartmental Land Use Committee (ILUC) for comment and approval.

A) LEGISLATIVE BASE

The principal pieces of legislation dealing with Crown lands are the Crown Lands Act and the Development Areas Lands Act R.S.N. 1970 c. 95. Under the Crown Lands

Figure 3.60

ENVIRONMENTAL IMPACT ASSESMENT PROCESS NEW BRUNSWICK


PROPONENT REGISTERS UNDERTAKING
SCREENING
EIA NOT REQUIRED CONDITIONS MAY BE IMPOSED
GUIDELINES PREPARED (PUBLIC REVIEW OF DRAFT)
SUBMIT TERMS OF REFERENCE
EIA REPORT PREPARED AND SUBMITTED
REVIEW OF EIA REPORT (REVIEW STATEMENT AND SUMMARY PREPARED)
PUBLIC MEETING(S)
DECISION BY LIEUTENANT-GOVERNOR IN COUNCIL
OTHER REQUIRED APPROVALS

Act, the Department of Environment and Lands issues grants and leases of Crown land and coordinates this activity with the planning and management of resource lands. The Development Areas Act enables the designation of specific areas in which the government exercises specific controls over speculation and land use. Agricultural development areas have been designated under the control of the Department of Rural, Agricultural and Northern Development, and a number of sites related to offshore oil and gas exploration and development have been designated under the control of the Minister of Development.

The Urban and Rural Planning Act R.S.N. 1970 c. 387 provides for the preparation and approval of Municipal Plans. The Act also provides for the preparation and implementation of Joint Municipal Plans, Regional Plans, Local Area Plans, Development Schemes, Protected Area Plans and Interim Development Orders.

B) JURISDICTION AND AUTHORITY

There are presently approximately fifteen government agencies with responsibilities for either managing, planning or designating land in Newfoundland for various resource uses.

The Lands Branch of the Department of Environment and Lands is responsible for consolidating and integrating land use plans at a provincial, regional and sub-regional level as part of an overall land management strategy for the province.

Consultation between government departments and agencies regarding either Crown or public lands has been formalized through an Interdepartmental Committee on Land Use. The committee was established by Cabinet Directive in 1983. It is chaired by the Director of Land Management of the Lands Branch of the Ministry of Environment and Lands.

Figure 3.61 - Planning Authorities Diagram
Figure 3.62 - Interdepartmental Land Use Committee Organization Chart
Figure 3.63 - Example of Projects Reviewed by the Interdepartmental Land Use Committee

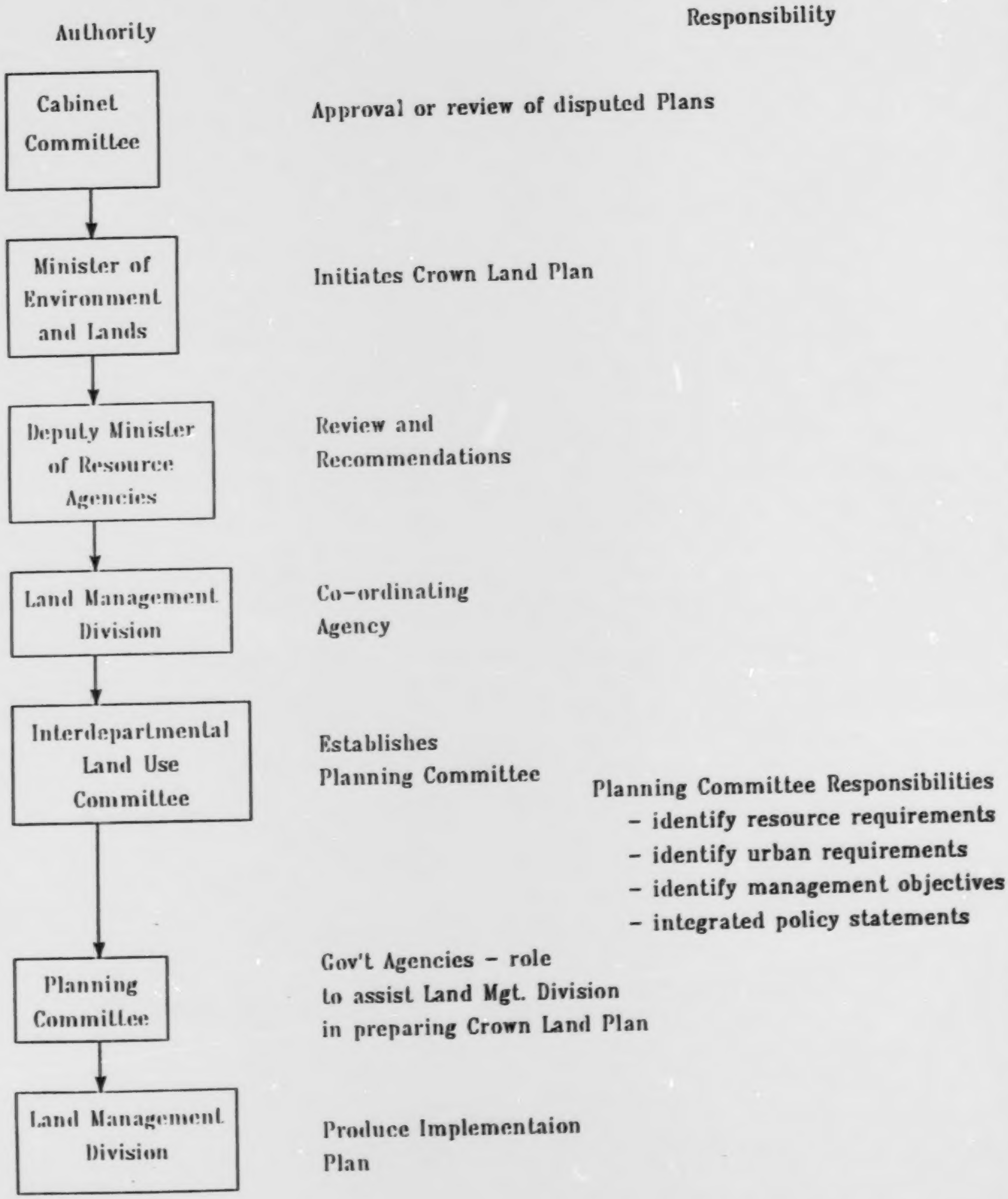
Consultation between government agencies with resource interests is formalized in the Interdepartmental Land Use Committee, established by Cabinet Directive in 1983. The committee is chaired by the Director of Land Management of the Lands Branch. Membership on the committee is open to any government department or agency and is at the Director level or above. All activities affecting the use and management of provincial Crown lands are reviewed by the committee. The review process is presently voluntary. The committee meets at the discretion of the Chair who circulates an agenda and related information prior to the meetings. Since the committee has been struck, about 80% of the projects reviewed have involved either forest access roads or silviculture projects. All plans must be approved by the ILUC which may also make recommendations regarding plans. There have been cases where plans have been rejected by the ILUC and where recommendations of the committee have been applied.

Issues which cannot be resolved satisfactorily by the Interdepartmental Land Use Committee are conveyed in writing to the appropriate Deputy Minister. Deputy Ministers then have the opportunity to respond to concerns prior to final recommendation.

Final recommendations of the Interdepartmental Land Use Committee are based on a general membership consensus. Recommendations for approval are conveyed directly

Newfoundland Figure 3.61

Planning Authorities and Responsibilities


Authority
Responsibility
Cabinet Committee
Approval or review of disputed Plans
Minister of Environment and Lands
Initiates Crown Land Plan
Deputy Minister of Resource Agencies
Review and Recommendations
Land Management Division
Co-ordinating Agency
Interdepartmental Land Use Committee
Establishes Planning Committee
Planning Committee Responsibilities
- identify resource requirements
- identify urban requirements
- identify management objectives
- integrated policy statements
Planning Committee
Gov't Agencies - role to assist Land Mgt. Division in preparing Crown Land Plan
Land Management Division
Produce Implementaion Plan

Newfoundland Figure 3.62

Interdepartmental Land Use Committee Organization Chart

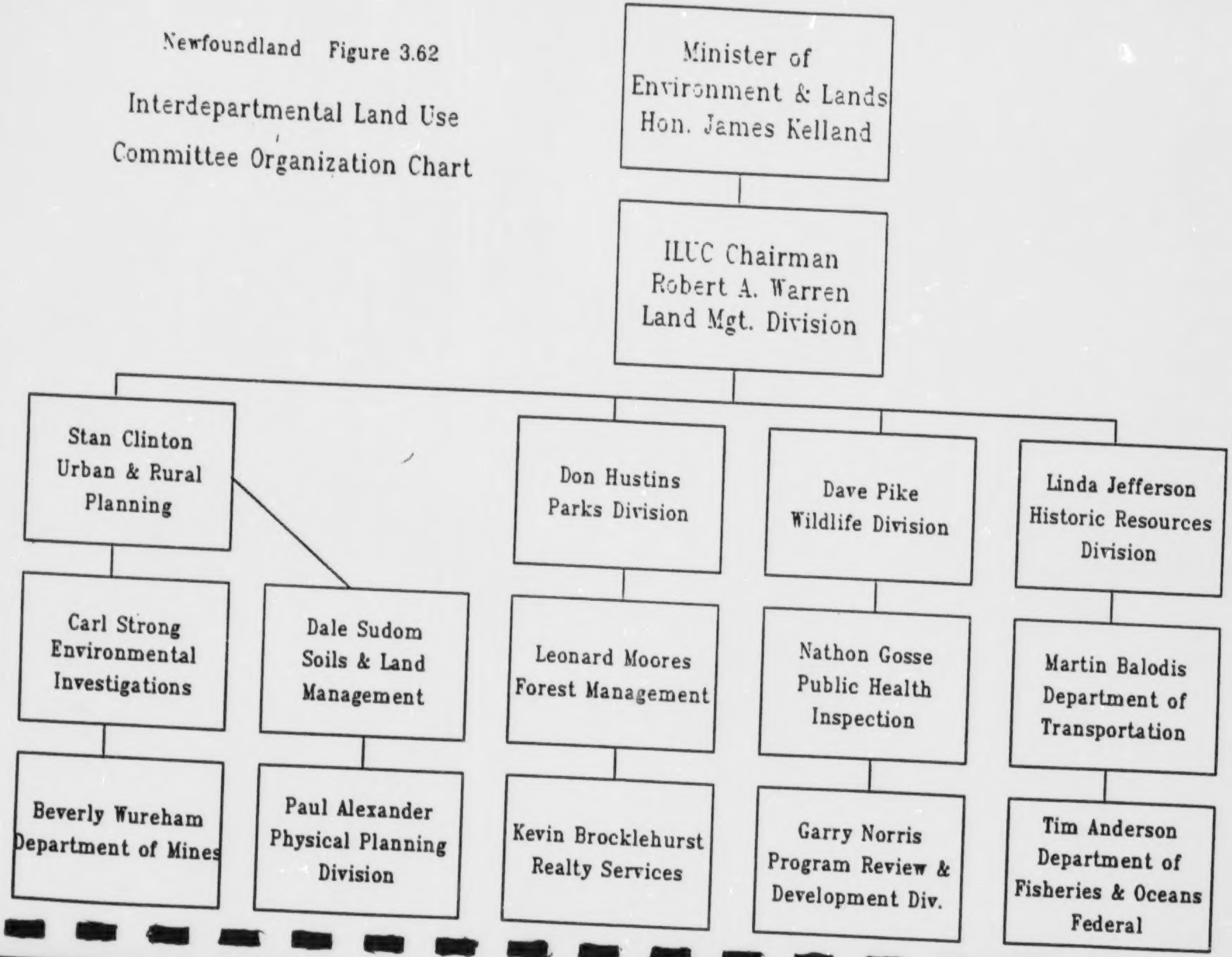
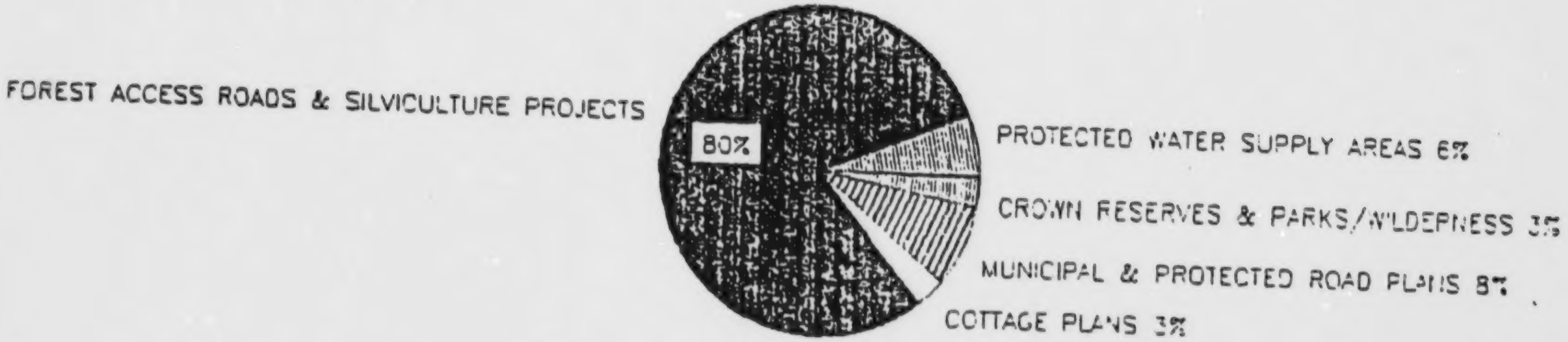

Minister of Environment & Lands
Hon. James Kelland
ILUC Chairman
Robert A. Warren
Land Mgt. Division
Stan Clinton
Urban & Rural Planning
Carl Strong
Environmental Investigations
Beverly Wureham
Department of Mines
Dale Sudom
Soils & Land Management
Paul Alexander
Physical Planning Division
Don Hustins
Parks Division
Leonard Moores
Forest Management
Kevin Brocklehurst
Realty Services
Dave Pike
Wildlife Division
Nathon Gosse
Public Health Inspection
Garry Norris
Program Review & Development Div.
Linda Jefferson
Historic Resources Division
Martin Balodis
Department of Transportation
Tim Anderson
Department of Fisheries & Oceans
Federal

Figure 3.63

EXAMPLE OF PROJECTS REVIEWED BY THE INTERDEPARTMENTAL LAND USE COMMITTEE



to the Deputy Ministers directly involved. Recommendations for refusal are referred to the Minister of Environment and Lands for final decision.

Prior to implementation, all proposals reviewed by the Interdepartmental Land Use Committee must be approved by the Minister of Environment and Lands.

C) PLANNING PROCESS

Figure 3.64 - Planning Process diagram
Figure 3.65 - Planning Process, Figure 1 from West Coast Crown Land Plan

The boundaries for Regional Crown Land planning areas are initially determined by the Lands Branch of the provincial Department of Environment and Lands. These tentative boundaries are then forwarded to the Interdepartmental Land Use Committee (ILUC) for comment and approval.

Once the planning area is established and approved, a separate sub-committee of ILUC is formed. The sub-committee is comprised of major resource agencies having a specific concern in the planning area. It has three functions:

1) to supervise detailed aspects of the process
2) to provide resource data
3) to help in resolving resource conflicts

The sub-committee is chaired by a member of the Land Management Division. Resource data is gathered and plotted on maps by Land Management staff as the basis for a conflict analysis. The objective of the conflict analysis is the preparation of draft policy statements, suggesting means of integrating uses and managing the conflicts. The analysis forms the rationale for the policy statements.

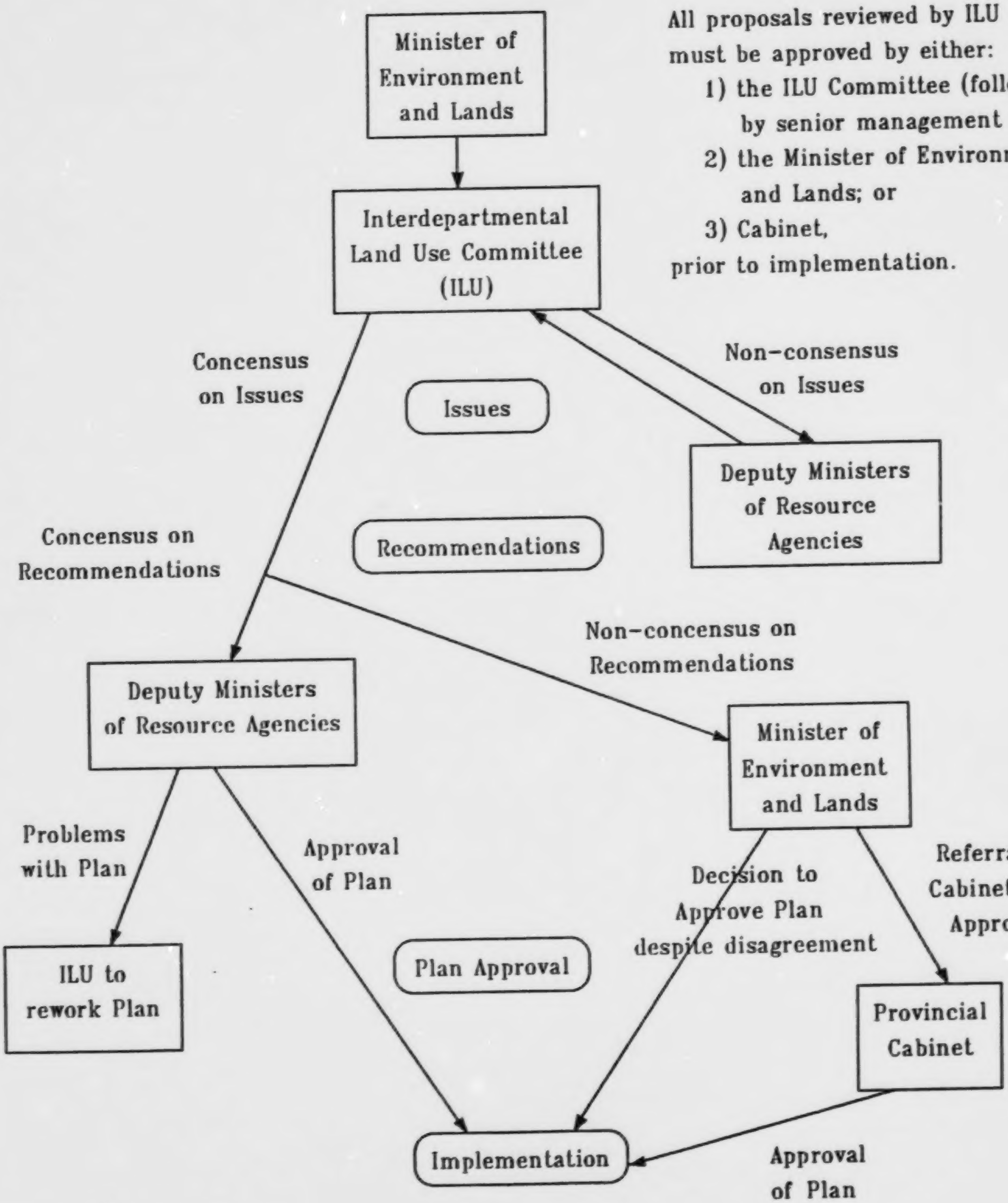
The draft policy statements are then brought before the sub-committee for review and approval. Often several drafts are required before approval is granted and in some instances full agreement may not be reached. Approved and disputed policy statements are then brought before the full Interdepartmental Committee for further review and approval. Policy statements not approved at this stage may then be referred to the concerned Deputy Ministers for further consideration. Should the disagreement remain unresolved, policy statements may then be forwarded to the Minister of Environment and Lands for yet another review. At this point, the Minister makes a decision regarding the disagreement or refers it to Cabinet for a decision. The planning process rarely goes past the Interdepartmental Land Use Committee stage for conflict resolution.

Public Involvement

There is no formal mechanism for seeking public input regarding the use of Crown lands in the province. Regional Crown Land Plans, although they refer only to Crown resources, have an influence on decisions on privately held lands through two factors. First, the sheer magnitude of Crown ownership can often force decisions towards the direction that the provincial government desires. As well, major private land owners have found that much regulatory confrontation with government agencies can be avoided through following the agreements reached in Crown land policies.

In order to resolve conflicts, ad hoc public hearings may be called by the Minister. This mechanism of public involvement has rarely been used. There are no mechanisms of

Newfoundland Figure 3.64
Planning Process



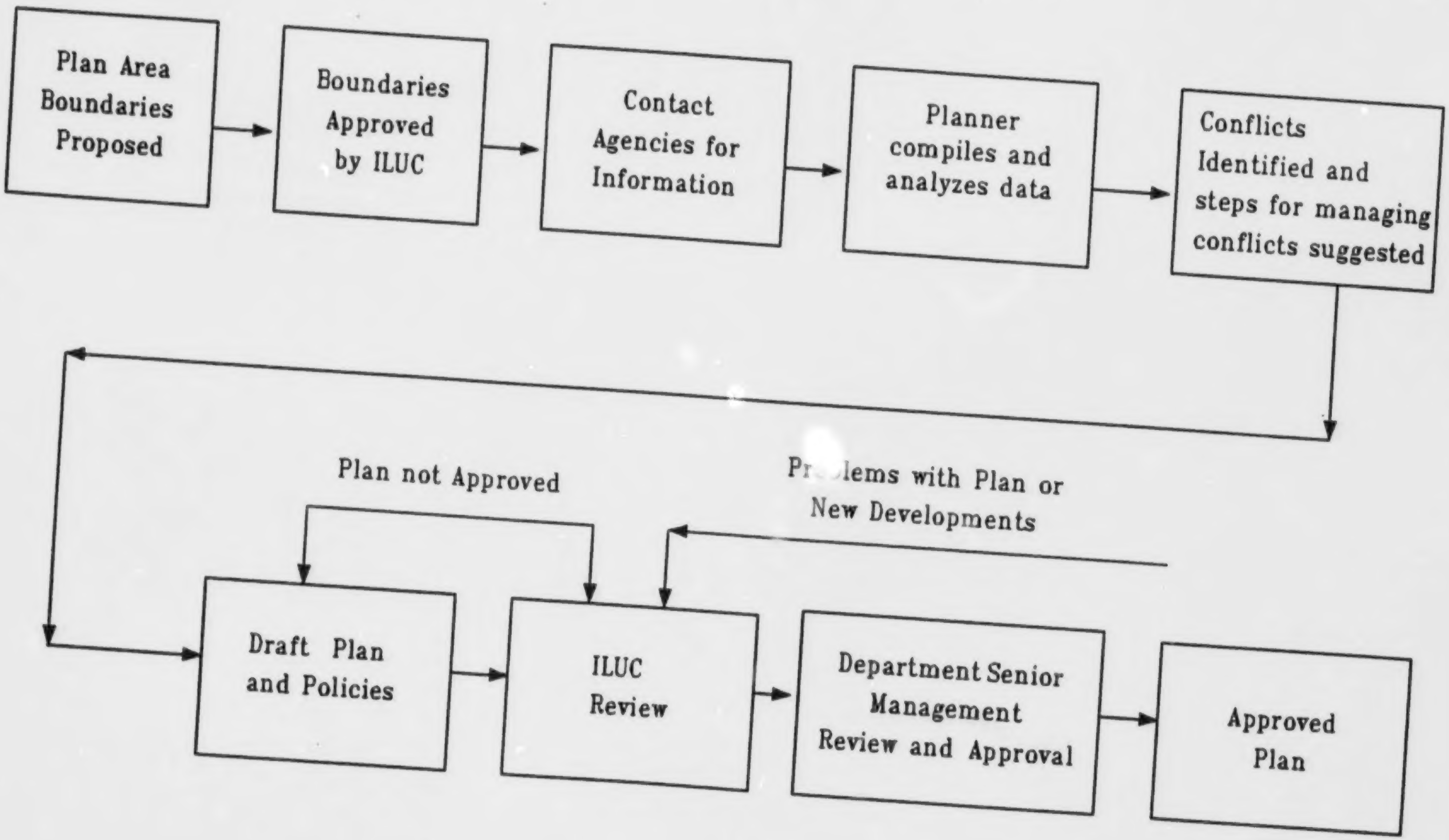
Minister of Environment and Lands
Interdepartmental Land Use Committee (ILU)
Concensus on Issues
Issues
Non-consensus on Issues
Deputy Ministers of Resource Agencies
Concensus on Recommendations
Recommendations
Non-concensus on Recommendations
Deputy Ministers of Resource Agencies
Minister of Environment and Lands
Problems with Plan
Approval of Plan
Decision to Approve Plan despite disagreement
Referral to Cabinet for Approval
ILU to rework Plan
Plan Approval
Provincial Cabinet
Implementation
Approval of Plan

All proposals reviewed by ILU must be approved by either:

1) the ILU Committee (followed by senior management review);
2) the Minister of Environment and Lands; or
3) Cabinet,

prior to implementation.

Newfoundland Figure 3.65
The Crown Land Integrated Planning Process


Plan Area Boundaries Proposed
Boundaries Approved by ILUC
Contact Agencies for Information
Planner compiles and analyzes data
Conflicts Identified and steps for managing conflicts suggested
Plan not Approved
Problems with Plan or New Developments
Draft Plan and Policies
ILUC Review
Department Senior Management Review and Approval
Approved Plan

intervener funding available and no formalized appeal procedures except through the court system.

Environmental impact assessment

Figure 3.66 - EIA process Nfld, Source: 1988 Summary, pg 54.

Environmental impact assessment in Newfoundland is a legislative requirement under the Environmental Assessment Act RSN 1980. It is implemented through Environmental Assessment Regulations 1984. The Act binds the Crown to assess the impacts of undertakings which may "have a significant adverse environmental impact." Undertakings may include an "enterprise, activity, project, structure, work, policy, proposal, plan or program" and may be declared either by the Minister of Environment and Lands or by fact of being listed under the Regulations. The Environmental Assessment Division of the Department of Environment and Lands coordinates the EIA process.

An Assessment Committee is appointed by the Minister of Environment and Lands for each undertaking requiring an Environmental Preview Report or Environmental Impact Statement. The committee usually consists of about ten members from government agencies with a direct interest in the undertaking with the Chair being a member of the Environmental Assessment Division. It reports to the Minister on scientific and technical matters. If an Environmental Impact Statement shows areas of concern involving significant adverse effects, a separate Environmental Assessment Board is established. A board consists of 2-5 members from outside the public service appointed by Cabinet on advice of the Minister of Environment. Public hearings held by each board are held within, or adjacent to the area of the proposed undertaking.

Implementation/Enforcement/Monitoring

Although most departments have enforcement capabilities through regulations, lack of funding prevents widespread enforcement actions. Presently, most Crown land activities are "self-policed" and there are significant non-compliance problems involving environmental impacts and land use activities.

There are no formal appeal procedures, however, appeals can be brought by concerned individuals to the involved agency or Minister. In general, government agencies encourage the bureaucratic rather than the political approach.

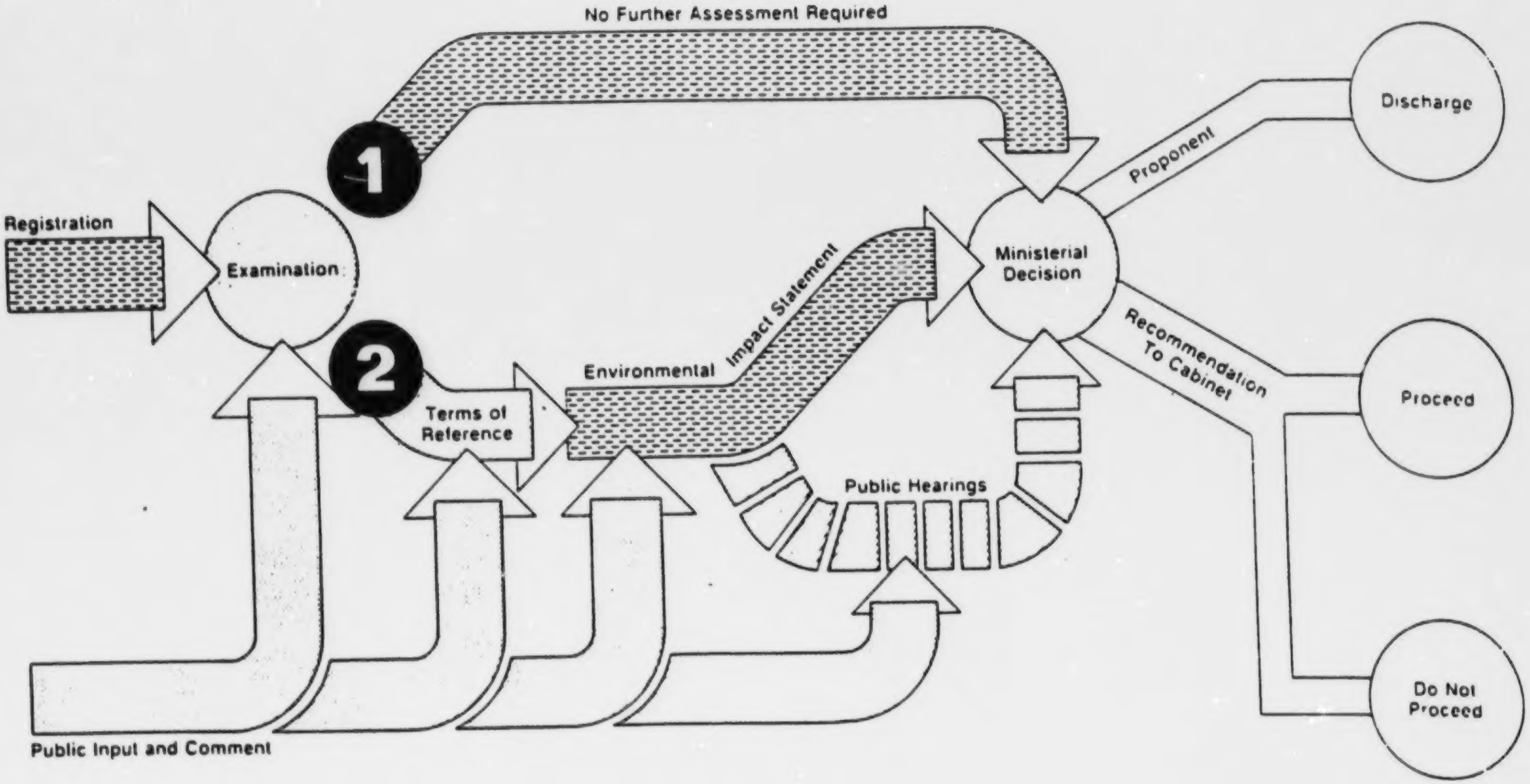
D) PLANNING PRODUCTS

Regional Crown Land Plans are prepared by the Land Management Division of the Lands Branch, Department of Environment and Lands. The policies outlined in Crown Land Plans are approved by the Department and by the Interdepartmental Land Use Committee. They serve as guidelines for allocating the use of Crown land and managing the resources of the region. To date, four Crown Land Plans have been completed: Random Island; Southern Shore; West Coast; and Central Avalon. These plans are largely inventories, recognizing a variety of user-established activities.

Following approval of the policy statements contained in Crown Land Plans, the Land Management Division produces an Implementation Plan for the area. The Implementation Plan contains more detailed information, such as forest inventories, soil capability maps and community infilling limits. While some activities may be in part

Figure 3.66

THE ENVIRONMENTAL ASSESSMENT PROCESS
SEQUENCE DIAGRAM


No Further Assessment Required
1
Registration
Examination
2
Terms of Reference
Environmental Impact Statement
Public Hearings
Public Input and Comment
Ministerial Decision
Proponent
Recommendation To Cabinet
Discharge
Proceed
Do Not Proceed

restricted in Crown Land Plans, the plans are not designed to be complete proactive land use zoning documents.

The majority of other land plans in Newfoundland are provided for under the Urban and Rural Planning Act 1970. Municipal Plans are prepared on behalf of a local council. The Joint Municipal Plan process, involving several municipalities has been little used. Regional Plans are prepared for areas defined as planning regions by the Minister of Municipal Affairs. Local Area Plans, when approved, must conform with existing Region Plans. Region Plans, Local Area Plans and Protected Area Plans are usually prepared by staff of the Provincial Planning Office in the Department of Municipal Affairs on behalf of the Provincial Planning Board.

This paper focuses upon the Regional Crown Land planning process rather than those plans undertaken by the Ministry of Municipal Affairs through the powers of the Urban and Rural Planning Act.

3.17 NEW SOUTH WALES, AUSTRALIA

Considerable portions of the land within the state of New South Wales are crown lands. Over 120 000 ha are designated as national parks, nature reserves or flora reserves. The state is divided into "regions" which are further subdivided into "locals". These subdivisions are made along political boundaries rather than on biogeoclimatic or geographic boundaries. Environmental planning and assessment form the essential features of a reformed environmental management regime in the State of New South Wales. This new process was enacted in 1980. Single purpose, individual resource management shifted to management of the environment as a whole. Public participation became a vital part of both the planning and the assessment stage.

A) LEGISLATIVE BASE

The Environmental Planning Assessment (EPA) Act 1979 and the Land and Environment Court (LEC), established by the Land and Environment Court Act, are the cornerstones of this new planning procedure. The Acts apply to urban, rural and hinterland environments with the LEC responsible for adjudicating appeals.

B) JURISDICTION AND AUTHORITY

The Department of the Environment is responsible for state and regional plans while local councils are responsible for local planning. The integration of various plans is the task of the Director of the Department of Environment and Planning. Proposed plans are forwarded by the proponent to the director, are developed and presented to the public and other government and non-government agencies and approved by ministerial decision (see Figure 3.67 and 3.68).

The Land and Environment Court is responsible for adjudicating appeals, can overrule development consents or denials or modify their conditions, and can demand an environmental assessment and evaluate it. Any person can appeal to the Court, although a process is in place to weed out vexatious or otherwise unfounded appeals. The National Government has not played a major role in the delineation of authority or environmental guidelines. Except for a few cases, the major move of the federal government has been to

Figure 3.67

Planning Tools in New South Wales

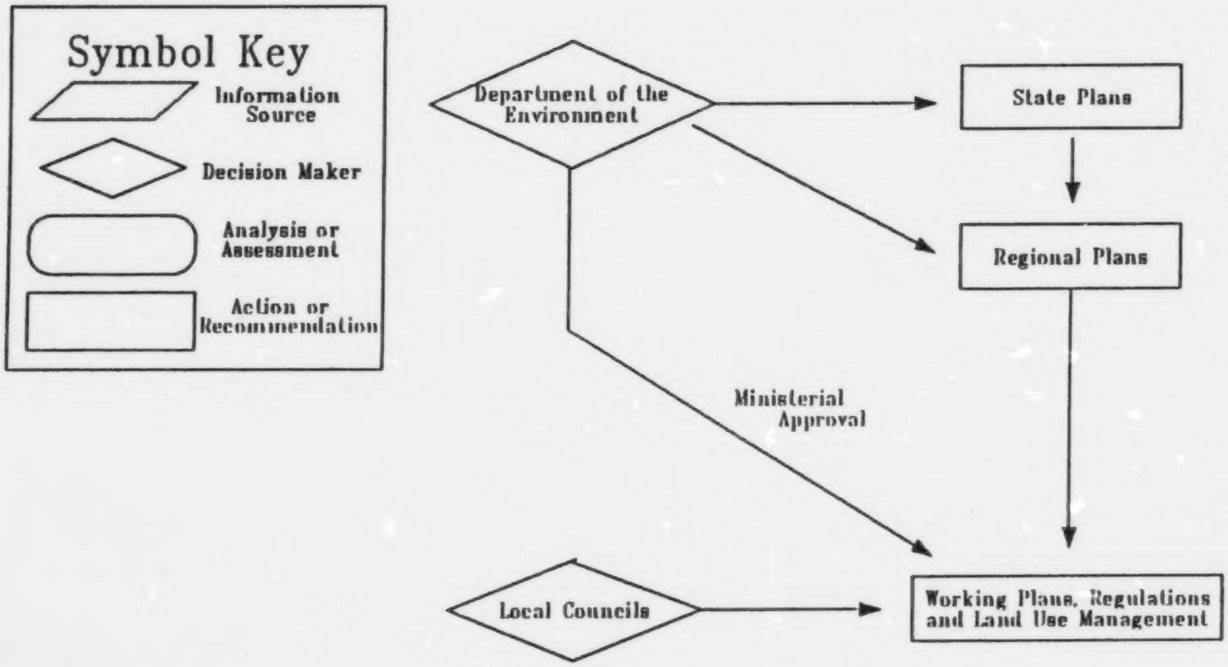
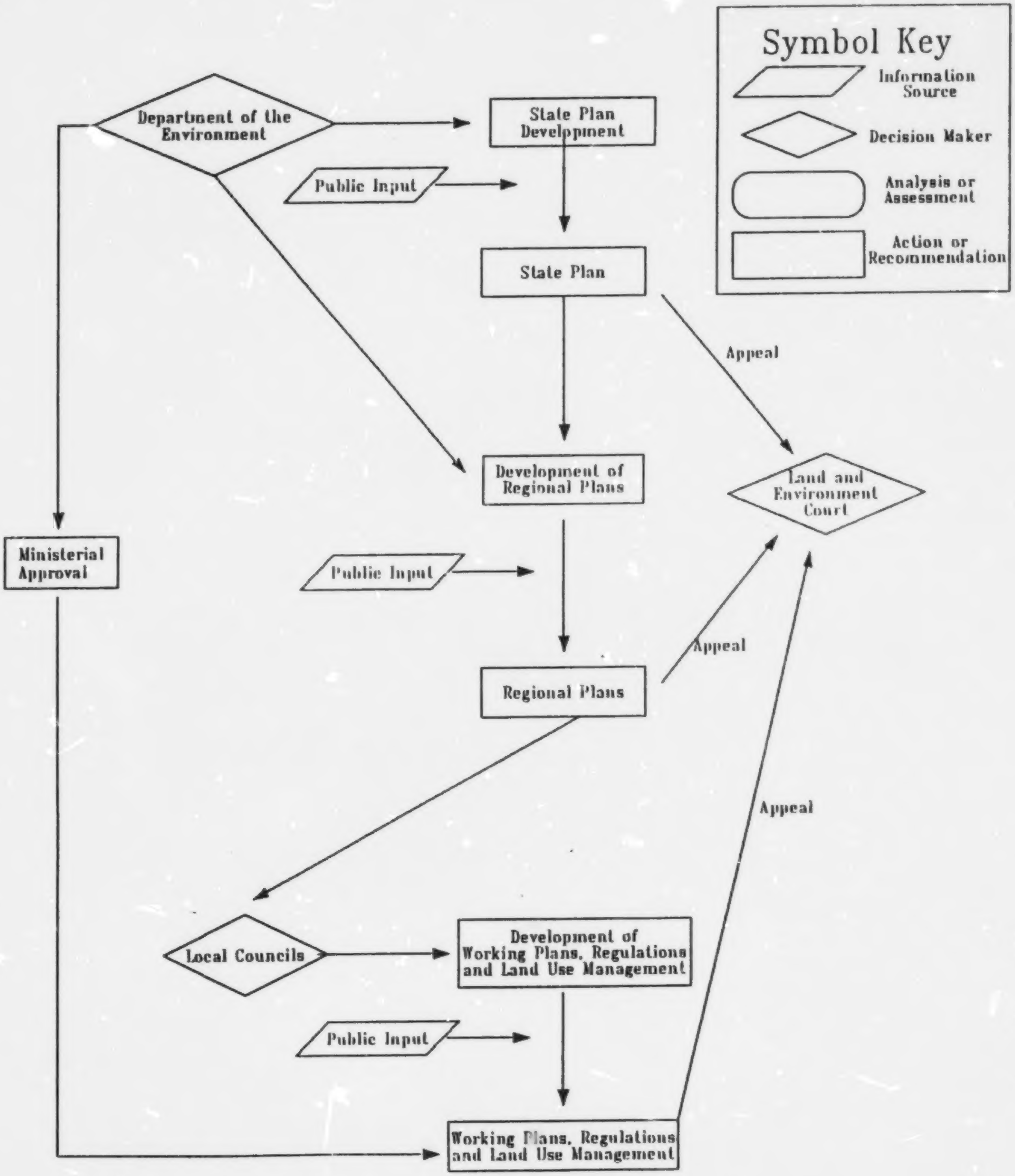

Symbol Key
Information Source
Decision Maker
Analysis or Assessment
Action or Recommendation
Department of the Environment
State Plans
Regional Plans
Ministerial Approval
Local Councils
Working Plans, Regulations and Land Use Management

Figure 3.68

Planning Process in New South Wales


Symbol Key
Information Source
Decision Maker
Analysis or Assessment
Action or Recommendation
Department of the Environment
State Plan Development
Public Input
State Plan
Appeal
Development of Regional Plans
Land and Environment Court
Ministerial Approval
Public Input
Appeal
Regional Plans
Appeal
Local Councils
Development of Working Plans, Regulations and Land Use Management
Public Input
Working Plans, Regulations and Land Use Management

establish certain committees and councils to address environmental concerns and resource development and to facilitate collaboration between the State governments and the Commonwealth (federal government).

Environmental Impact Assessment

Environmental impact assessments are required for local plans if a plan has a "designated development", an indication of significant environmental impacts, or if consent is required to continue. The LEC can also require an impact assessment to be done if a citizen interest group forwards an appeal.

Any proposed activity that is likely to effect the environment must be subjected to an assessment. The consenting authority can make the determination of "likelihood". If an assessment is not requested or if the assessment was deemed by interested parties to be inadequate, appeals can be made to the Environment and Land Court. Regional plans typically require an environmental study.

C) PLANNING PROCESS

Local environment plans are prepared by local councils. The plans are submitted to the Department of Environment and Planning (DEP) to ensure that the plan meets certain state criteria and policies. After public hearings and submissions have been taken into account, the plan is revised and resubmitted to the DEP. The Public again has the opportunity to respond and the DEP director reports to the minister who makes the final decision unless it is appealed to the LEC.

Development in plans are classified as either requiring consent, not requiring consent or designated development. Regional development plans generally cover a much larger area than a local plan, and are typically delineated by an environmental system or a pattern of settlement. The goal is to separate local and regional planning issues and to facilitate interdepartmental coordination. Public submissions are considered and a public inquiry may be held depending on the issues. Again the minister makes the final decision.

State planning policies address issues of state wide significance and have the power of law. Local and regional authorities must conform to these policies. They are designed to provide direction and guidelines to develop local and regional plans. However, techniques and standards for formulating environmental plans are not well specified, resulting in significantly varied plan qualities.

State policies provide guidelines for the development of local and regional plans and the preservation of endangered or rare ecosystems. Regional plans cover a large general area. Local plans become specific in dealing with potential resource allocation and management, utilizing the general directives of the state and the more specific regional guidelines.

3.18 UNITED STATES FOREST SERVICE

The United States Forest Service (USFS) is responsible for the management of 192 million acres (77.7 million hectares) of public federal forest lands in the United States. Land use planning is undertaken at the national, regional and national forest level.

A) LEGISLATIVE BASE

Legislation which influences the USFS include:

The Forest and Rangeland Renewable Resources Planning Act, 1974. This Act requires the USFS to conduct a national assessment of all renewable resources every ten years, and a national program to assess resource use in national forests every five years. This Act also legislates public participation opportunities during USFS planning.

The National Forest Management Act, 1976 (NFMA). Enacted as an amendment to RPA, NFMA is the USFS planning act. The Act requires a commitment to land use planning through multiple resource use and sustained yield principles. Economic management and public participation were to be given greater emphasis. This Act imposed a national direction on USFS planning, the direction being a compromise allowing for Congress and the USFS to share management responsibilities. Each forest or administrative unit now requires an integrated forest plan.

The National Environmental Policy Act, 1969 (NEPA). This Act requires that an Environmental Impact Statement (EIS) accompany all federal proposals which may significantly affect the quality of the human environment. The extensive information required for an EIS (as interpreted by the courts), and the degree of public participation required in the preparation of an EIS are seen to have revolutionized federal land use planning and management.

The Federal Land Policy and Management Act, 1976 (FLMPA). Applicable mostly to the Bureau of Land Management, this Act advocates interdisciplinary and long-term planning. It is the statutory authority for the management of grazing lands in the United States.

The Multiple Use - Sustained Yield Act, 1960 (MUSYA). The purpose of this Act is to ensure that activities on national forest lands meet the needs of the American people without impairing the resource. Unfortunately, this Act is nebulous, giving little planning guidance.

The National Wilderness Act, 1960. This Act is used to set aside wilderness areas from development. This Act has a direct impact on the USFS.

The National Wild and Scenic River Act and The Trails System Act, 1968. These Acts protect rivers and trail systems, thereby influencing USFS planning.

The result of this legislation is that planning is no longer left to the discretion of the USFS. It is a legislated process which requires resource inventories, economic efficiency, interdisciplinary planning, regular plan review, a high degree of environmental accountability and public involvement.

B) JURISDICTION AND AUTHORITY

Authority within the USFS is hierarchically structured with approvals systematically made at one level above the requisite planning level. Ultimate authority rests with both the President and Congress of the United States through their approval of national policies and guidelines established by the Chief Forester of the USFS, and their ability to influence the USFS enacting legislation.

Planning principles for federal public forest lands are established by Congress through legislation. National Level Planning is accomplished through provisions of the Forest and Range Renewable Resources Planning Act(RPA) requiring the delineation of national policies and guidelines to direct planning at the regional and national forest level. Regional Guides are prepared at the regional level and outline specific guidelines and policies for each planning region. Forest Land and Resource Management Plans (RMP) are prepared at the forest planning level. Most planning activities are undertaken by the USFS itself (see Figure 3.69).

C) PLANNING PROCESS

Figure 3.70 - Planning Tools - United States Forest Service
Figure 3.71 - Planning Process - United States Forest Service

Under RPA, an RPA Assessment is required every ten years. This Assessment, completed by the Chief Forester, is a national inventory of renewable resources on public and private property. The Assessment also includes analysis of present and future demand for resource use, economic forecasting, analysis of policy issues, pertinent laws and regulations, and research needs. Additionally, the RPA Program must be developed by the Chief Forester every five years. It is a national plan that acts as the USFS long-range planning tool. Policies, priorities and utilization objectives for individual forest regions are specified. Minor revisions of the RPA Assessment and Program are allowed. Major revisions require re-initiation of the entire planning process.

Passage of these two national planning instruments by Congress and the President allows for the development of Regional Guides, the guides being a statement of policies and guidelines for resource allocation and use in each region. The Chief Forester develops an agency-wide policy for the development of Regional Guides. Each Regional Guide is prepared through the Regional Forester by an interdisciplinary planning team. Public input is required. The Guide must also ensure coordination between other federal, state and private interests in the planning region. Regional Guides are approved by the Chief Forester. Non-approval re-initiates the Guide preparation process.

Based on the Regional Guide, Forest Supervisors for individual forests or other specified jurisdiction prepare Forest Land and Resource Management Plans through the establishment of interdisciplinary planning teams. It is mandatory that the Forest Supervisor ensure coordination with other federal, state and public interests, consistency with national and regional policies and guidelines, and that the public has adequate opportunities for input into the planning process. The plan is approved by the Regional Forester. Non-approval re-initiates the Forest Planning Process. The time from plan initiation to approval is usually 3 to 4 years.

The public may appeal the approval of a forest level plan through the courts.

Public Participation

Public participation is mandatory for USFS planning as defined by both NFMA and NEPA legislation. Public participation is seen to exist at all planning levels from issues identification to plan implementation. The emphasis of public participation appears to be consultation and information dissemination. Public input is also solicited at the operational decision level i.e, the public is often consulted on actions required to achieve specific planning goals.

Figure 3.69

Planning Authorities – United States Forest Service

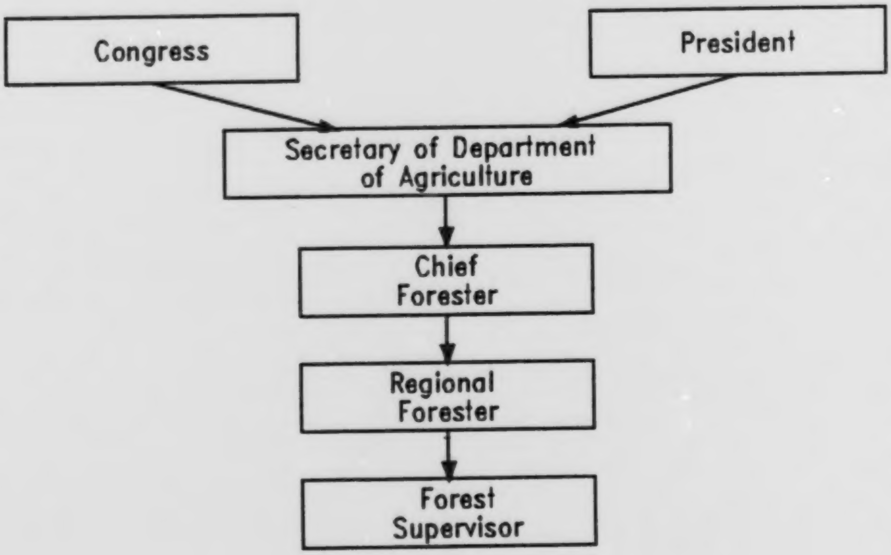
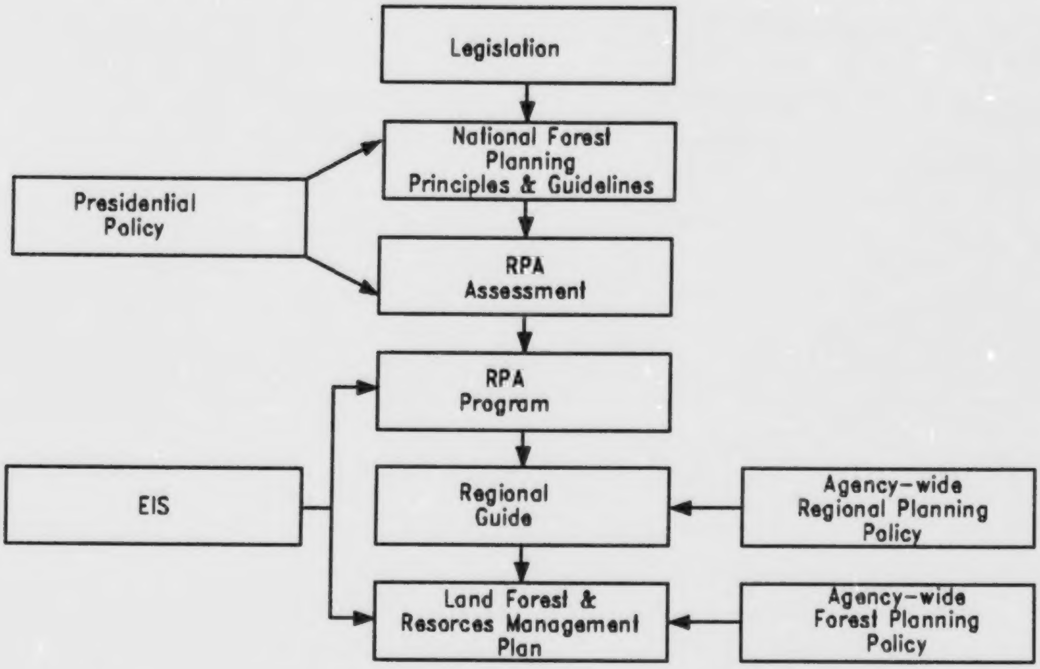
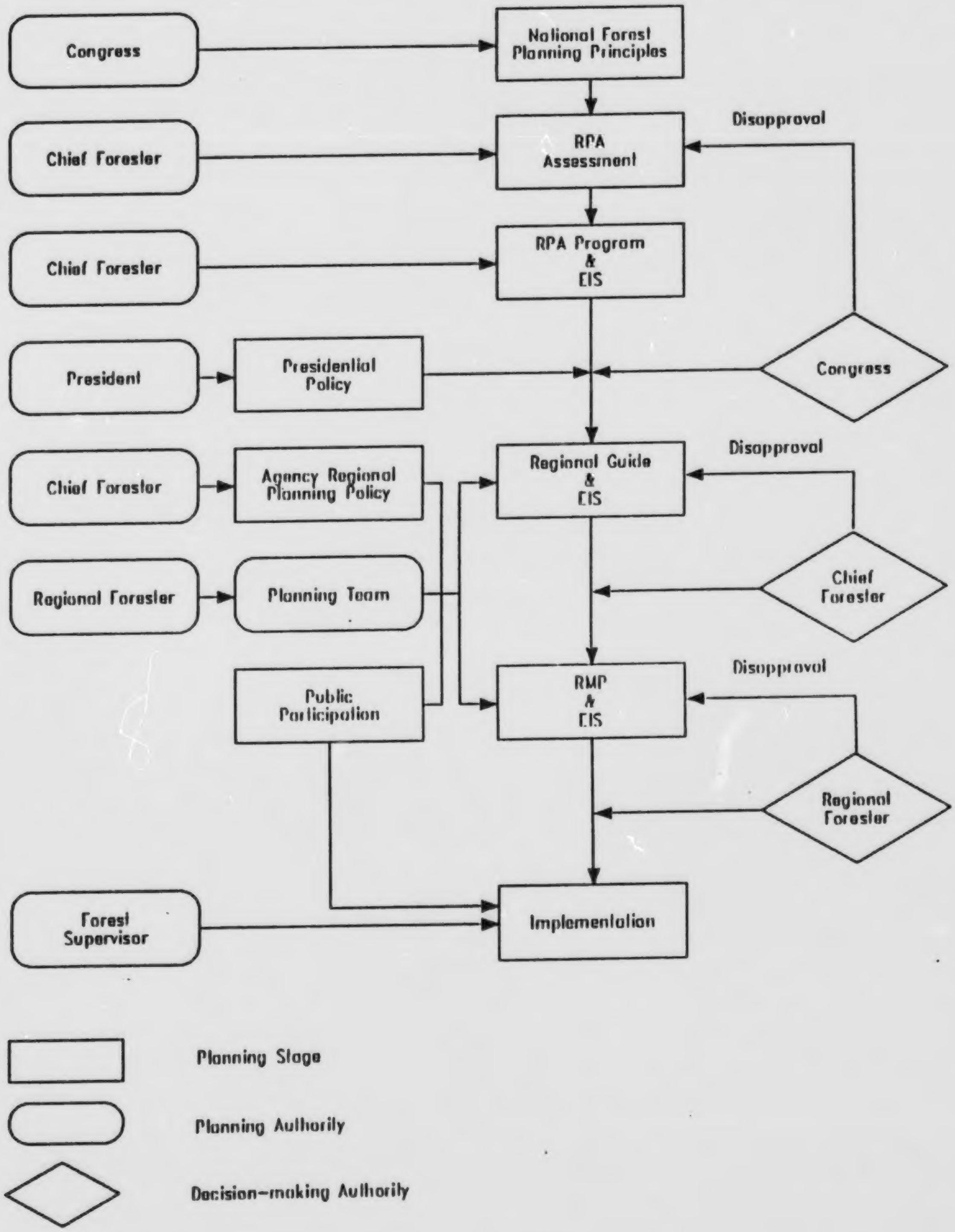

Congress
President
Secretary of Department of Agriculture
Chief Forester
Regional Forester
Forest Supervisor

Figure 3.70
Planning Tools — United States Forest Service



Legislation
National Forest Planning Principles & Guidelines
Presidential Policy
RPA Assessment
RPA Program
EIS
Regional Guide
Agency-wide Regional Planning Policy
Land Forest & Resorces Management Plan
Agency-wide Forest Planning Policy

Figure3.71
Planning Process - United States Forest Service


Congress
National Forest Planning Principles
Chief Forester
RPA Assessment
Disapproval
Chief Forester
RPA Program & EIS
President
Presidential Policy
Congress
Chief Forester
Agency Regional Planning Policy
Regional Guide & EIS
Disapproval
Regional Forester
Planning Team
Chief Forester
Public Participation
RMP & EIS
Disapproval
Regional Forester
Forest Supervisor
Implementation
Planning Stage
Planning Authority
Decision-making Authority

Environmental Impact Assessment

Environmental Impact Statements (EIS) are required by NEPA (1969) for all federal projects with substantial environmental implications. EIS are completed for the RPA Program and all Regional Guides and Forest Land and Resource Management Plans. Substantial public participation is available through the development of EIS.

Monitoring

In the USFS planning process a monitoring plan is incorporated into the RMP, which is compiled at the forest level. The monitoring plan is tailored to the specific area and reflects guidelines and standards that allow quality control monitoring. This compliance or "implementation" monitoring is to be done at the forest and district levels. Also included at this level is monitoring of expected outcomes in terms of the money spent and how close the Forest Service kept to projected costs. Effectiveness and validation monitoring are also included in the formal process. Effectiveness monitoring tests whether the standards and guidelines are appropriate for achieving the goals outlined in the plan, and validation monitoring is done to check that inventory information and data are accurate and up to date.

The monitoring plan is announced to the public and legally binding as a contract with the public. Projected costs, expected output, exactly what is to be monitored, the frequency of monitoring, and the evaluation criteria used, are made public in this plan. Evaluation of the monitoring will be done at the regional level so that it can be coordinated with other federal and state agencies. An annual monitoring and evaluation report is to be published and made public. These plans are just beginning to be implemented in 5 of the 19 forests under the USFS jurisdiction, with the other 14 plans slated to be completed and implemented before September 30, 1990.

D) PLANNING PRODUCTS

National Level

Through the RPA Assessment and the RPA Program, policies, priorities and utilization objectives for the USFS and specific forest regions are specified. This setting of local management regulations at the national level may prove insensitive to local conditions. Loss of management flexibility at the local level is seen to be a limitation of this process.

Regional Level

Regional guides define specific policies and guidelines for resource use and allocation within a defined forest region.

Forest Level

RMPs are developed at the individual forest level and delineate policies and guidelines to achieve management goals set at the national and regional level.

4. CONCLUSIONS:

AN INTER-JURISDICTIONAL COMPARISON AND SUMMARY

4.1 INTRODUCTION

Detailed descriptions of the planning institutions and processes in the jurisdictions examined are found in Part 3. In this section the various aspects of the different jurisdictions are summarized and compared and norms and exceptions are identified.

A summary of the organizational structures (% of land base, allocation of planning authority, etc.) found in the various jurisdictions is attached as Appendix 1.

4.2 PLANNING PROCESSES

A) LEGISLATIVE BASE

The norm for this component seems to be an act such as a "Crown Lands Act" which places administration of rural crown lands in the hands of a lead agency such as the Department of Lands and Forests (N.S.) or the Ministry of Natural Resources (Ontario). Such an agency will usually be charged with making, or at least coordinating, land use allocation decisions between competing uses such as forestry and recreation. As part of this process they will receive input from other departments such as Mines and Energy, Environment, Transport etc.. Planning responsibilities in urban and rural municipalities are covered separately through Municipal Planning Acts, through which a body such as the 'Department of Municipal Affairs' is set up.

For typical jurisdictions the Crown Lands Act (or equivalent) does not lay out in detail the procedures or goals for the planning process. Specific procedures are usually developed through departmental policy. Thus the planning process is often implemented and developed through bureaucratic change rather than legislative reform.

There are various exceptions to this model. In Manitoba the Crown Lands Act delineates the type and intensity of use and the amount of development that can occur on a site specific basis through a land use classification system. The Oregon Land Use Act (1973) requires all city and county jurisdictions to complete comprehensive plans and land use regulations based on state-wide standards for plans. Standards are set through 19 goals for planning which have the effect of law. These are developed by a seven member Land Conservation and Development Commission (LCDC) appointed by the governor, and give explicit instruction as to the direction and nature of local land use planning. Each local jurisdiction is then required to submit its comprehensive plan for approval to the LCDC via the Department of Land Conservation and Development. This system ensures that comprehensive plans are consistent with state goals.

Provisions of Quebec's Land Use and Development Act stipulate that Regional County Municipalities must prepare land use development plans which will reflect both municipal and departmental policies regarding use of land. The act sets out four principles governing land use planning and development which define the areas of responsibility of the three levels of decision-making, set mandatory processes for public information and consultation, and require coordination between different levels of government.

B) JURISDICTION AND AUTHORITY

Canada

The norm for Canadian jurisdictions is a hierarchy of interdepartmental committees with final authority for decision making resting with Cabinet. The specifics of the committee structure and the function assigned to particular levels vary however. For example, Manitoba has its planning committees set out in legislation while Alberta relies upon government policy for its planning process. The Alberta system, implemented through government policy rather than legislation, retains a degree of administrative flexibility but is more easily subject to change at government whim.

Responsibility for planning is generally assigned to the dominant resource agency in the jurisdiction. Exceptions to this general rule include Manitoba and Quebec. In the southern portion of Manitoba, planning is the responsibility of an agency level interdepartmental Crown Land Classification Committee while planning in the north remains with a single agency. In Quebec, responsibility for land use planning is given to Regional County Municipalities. Legislation stipulates that plans must reflect both municipal concerns and provincial policies regarding the use of the land. A Cabinet committee sets provincial policies and an independent, appointed commission reviews the planning process.

There are other examples of independent commissions involved in land use decisions. Notable is the Prince Edward Island Land Use Commission. The Commission, appointed from the private sector by Cabinet, makes recommendations on provincial policies and acts as an appeal body for decisions made under the Planning Act.

In the northern territories, final authority for land use planning rests with the federal and territorial ministers. Native groups are also signatories to the agreement which forms the basis of planning in the north. In the Northwest Territories planning authorities have been determined on the basis of native land claim settlements as in the Lancaster Sound Regional Planning Commission in the eastern arctic.

United States

In the jurisdictions reviewed, Alaska is unique in requiring land use planning under the state constitution. In Alaska, as in other states, a commissioner (in Oregon the State Forester), accountable to the state legislature, arbitrates conflicts over plans. State resource boards in Washington and Oregon oversee forestry and land use practices.

Planning in the US federal agencies (BLM and USFS) is almost entirely circumscribed by federal legislation. The legislated process requires that the agency undertake interdisciplinary planning, prescribes public involvement procedures and defines review procedures. Final authority rests with the President and Congress through their approval of national policies and legislation.

New Zealand

In New Zealand planning functions are undertaken at the district and regional level within a larger state framework and authority. The central government has authority to set national standards and guidelines for issues of national significance such as water, hazardous waste and resource allocation. The Ministry for the Environment is the arbiter for all legislation and policy affecting the environment and resource use.

New South Wales

In New South Wales authority for state and regional plans rests with the Department of the Environment, while the national government plays only a minor role in terms of guidelines and standards.

C) PLANNING AREA

In most jurisdictions the planning area is divided into two or three levels. The first is province or state-wide. At this level broad policy directions and priorities are set. The jurisdiction may then be further subdivided into planning regions and planning districts (e.g.. New Brunswick), or Administrative regions and planning regions (e.g.. Ontario). Regional plans often provide an overall strategy within which district land use plans can operate and as such are the main planning tool.

Variations on this pattern occur in several jurisdictions. In Alberta, regional planning authorities give the planning direction for broad areas of the province, but the integrated resource planning process has focussed on sub-regional plans over the past few years. Thus, desirable patterns of land use and an appropriate mix of resource use activities are identified at this level. In Alaska, there are State-wide, Area and Management Area Plans. Area plans are the main planning tool and must be developed prior to allowing certain activities on state public lands. Management Area plans may be developed for either smaller areas or specific resources which require greater planning detail than that afforded by area plans. These detail very specific guidelines for land use activities.

New Zealand is organized into 13 regions subdivided into 79 districts called territories. Regional councils are directly elected authorities, formed on the basis of large water regions with boundaries related to whole water catchments. Their major functions are resource management and coordination, and policy coordination of other local government functions. This method of basing planning regions on environmental/geographical boundaries seems unique among the jurisdictions studied.

D) TIME FRAME

The time required to initiate, develop and approve land use plans for the jurisdictions considered varies considerably from days to four years. Only the Northwest Territories appears to mandate a specific time within which plan development activities must be completed. All other jurisdictions require planning be completed within a reasonable amount of time.

The time frame for planning evolves from the nature of the planning process for individual jurisdictions. Planning in Newfoundland is basically a process of resource inventorying. Management decisions are made very quickly if this information exists. Conversely, formal land use planning undertaken by the United State Forest Service and the Bureau of Land Management involves comprehensive resource evaluation and environmental impact assessments, opportunities for public participation and review, and often litigation over proposed provisions contained within the planning document. Planning activities may take up to four years to complete.

The time required from initiation of planning to plan approval must be sufficient to ensure all legitimate interests have adequate opportunity to participate in the planning process. Conversely, the planning process must be relatively short to ensure that all interests remain active during all stages of planning and that the final planning document remains relevant to prevailing conditions.

E) INITIATION OF PLANNING

Land use planning is initiated in one, or a combination, of three ways within the jurisdictions reviewed: systematically; responsively; or selectively. Additionally, planning can be initiated as either comprehensive, to include all resource and land use sectors, or selective, to include only certain resource or land use sectors. In all cases planning initiation is the result of specific legislation or agency policies defining the type of planning process to be initiated.

Systematic initiation attempts pro-active and comprehensive planning to encourage recognition and avoidance of conflicts through the delineation of planning policies and objectives for all desired land uses. Since policies and objectives are clearly defined, planning activities should be consistent across the relevant jurisdiction. Systematic initiation of planning dominates in the American jurisdictions reviewed i.e, the Bureau of Land Management, United States Forest Service, Alaska, Oregon (municipal planning only) and Washington, and New Zealand and New South Wales.

Responsive initiation requires the commencement of planning activities be based on either a perceived resource conflict or a proposal for resource utilization. Initiation in this manner is seen to be reactive, occurring only as required. Planning regions may be defined prior to responsive initiation, or may be defined based on the area of conflict or resource utilization. Responsive initiation may result in a lack of continuity and less opportunity for resource coordination between planning regions. Planning is initiated in this manner in the provinces of Alberta, Manitoba, Saskatchewan and the Yukon Territory.

Selective initiation applies to the initiation of planning for a singular resource or land use. Selective initiation may be systematic or responsive based on provisions of the planning process. Selective initiation may result in non-integrative planning for all resource or land use sectors. Also it is likely the needs of the single resource or land use will dominate. Other resources may not be adequately represented by this planning method. Selective initiation occurs in the provinces of New Brunswick, Nova Scotia and Ontario (Timber Management Plans only), and the State of Oregon (Long Range Timber Plans only).

F) PUBLIC PARTICIPATION

Issues related to public participation are discussed in a companion background paper to this document.

G) CONFLICT RESOLUTION

As noted above, in any planning process where choices are being made about the allocation of land or resources , different parties or interests will have different priorities and conflict will arise. It is clear from the study that few jurisdictions have adequate conflict resolution mechanisms built into their planning processes or institutions.

As a result, the courts are often called upon to resolve disputes concerning resource allocations and land use rights. The B.C. Ombudsman's Office, in a brief report, presented 7 reasons why litigation is the least appropriate way to resolve public disputes. The report suggests a more appropriate mechanism is that of consensus building by calling for a voluntary, mutual agreement between what appear at first to be competing interests. The Timber, Fish and Wildlife Agreement(TFWA) in Washington State is an example of such an arrangement.

The study suggests that conflicts between various government agencies are typically solved by some sort of interdepartmental committee. Most jurisdictions utilize such a committee, either in the development of plans (the Strategic Land Use Plan in Ontario) or in assuring the plans meet specific objectives (Policy Advisory Committee in the Yukon). If the issue or conflict cannot be resolved at this level, the problem is moved to progressively higher levels in the bureaucracy to a point where the issue is resolved in cabinet. For instance, a hierarchy of interdepartmental committees for review, approval and resolution of disagreements is utilized in Alberta.

Because Quebec has devolved its allocative responsibility from the provincial government to Regional County Municipalities, resource allocation conflicts are arbitrated by the departmental committee on planning and regional development (COMPADR). This committee is composed of various ministers who deal with land use allocation and chaired by the ministre a l'Amenagement et a la Decentralisation.

Conflicts existing between proponents and agencies, the public and agencies and the proponents and the public are typically expressed during whatever public participation process is used, and in hearings and commissions or through advisory boards. These processes are designed to avoid or resolve conflict by, at least theoretically, ensuring the participation of all involved and interested parties. Commissions and boards then present recommendations to the agencies or minister with respect to resolving or mitigating any remaining conflicts. Formal processes for initiating hearings or commissions designed specifically for conflict resolution are not common and are typically ad hoc.

In Manitoba, the Chairperson of the Clean Environment Commission, under the authority of the Dept. of the Environment, may act as mediator in environmental disputes. In Oregon, the Forest Resources Planning Program Director and the Land Use Planning Coordinator are also utilized in informal mediation functions to resolve land use conflicts.

In Alaska, planning teams consisting of representatives from all interested parties have proven to be rather cumbersome and inefficient in resolving disputes.

The consensual resolution of public interest disputes - such as those encountered in the course of Crown land use planning - is discussed in the 1988 annual report of the Ombudsman of British Columbia (British Columbia, 1989).

H) MONITORING AND ENFORCEMENT

In all the jurisdictions reviewed monitoring and enforcement was the weakest of all components. Few jurisdictions have in place a systematic process for the monitoring of the implementation of plans (the US Forest Service being a notable exception). Rather, the norm is that failures in or deviations from the plan come to the attention of planning authorities only by virtue of their visibility to the public or the planning bureaucrats themselves. Monitoring relates to the issue of review as well (see Section I below).

Enforcement of planning processes is carried out by law or policy, that is the process will be mandated by law (see Section A) or by policy established by government (see Section B).

I) REVIEW

Plans and planning activities require periodic review to ensure they remain relevant to evolving environmental, social and economic conditions.

Review can be defined as mandatory or discretionary, comprehensive or selective.

Mandatory stipulates that reviews be undertaken at defined intervals. Discretionary reviews are to be completed as the need for review arises. While mandatory review may ensure planning remains current, review may not coincide with evolving conflicts. In some instances conditions may not warrant review, thereby leading to inefficiency. The time frame for mandatory review ranges from one year in Manitoba to five to ten years in Alaska and Oregon. Discretionary review has the capacity to be adaptive to evolving environmental, social and economic conditions. However this capacity can be restricted by the decision-makers willing to react to these changing conditions. Discretionary review appears to exist in most of the jurisdictions considered.

Comprehensive review ensures that all resource sectors will be represented in the review process, while selective review involves certain aspects of the planning process or resource sectors. Comprehensive review will ensure that management of all resource sectors will remain current and coordinated, even though review may be redundant for sectors which have not changed. Selective review will be sensitive to individual resource sectors. However, important issues for other sectors may be overlooked through this type of review.

In most jurisdictions the review process does not involve re-initiation of the planning process. Rather review is a process of strategic amendment of plan provisions to ensure planning goals and objectives are attained. What appears to be lacking in most Canadian jurisdictions is review at the provincial level. Oregon, Washington, the Bureau of Land Management and the United State Forest Service all have formal or informal processes to at least try to keep state or agency wide goals and objectives for planning current to evolving conditions.

J) APPEAL PROCEDURES

Appeal procedures exist at federal, provincial or municipal levels of government. Since the goal is to understand appeal procedures as they relate to crown land planning, municipal appeals procedures and the like will not be reviewed. It should be noted that appeals typically deal with the rescindment of a decision due to procedural or substantive misapplication, not simply that the appellant doesn't like the decision. The opportunity to voice project disapproval is more efficiently dealt with as part of the public participation process.

Formal Appeal Procedures

Formalized appeal procedures (aside from judicial appeals) do not exist in most Canadian jurisdictions. However, all jurisdictions have the opportunity of judicial appeal through courts, given that the appellant has standing. In this respect there is considerable variation. In New Zealand, anyone can apply for and receive standing, causing significant problems in terms of delays encountered when, for example, a competitor wishes to delay or prevent a project from proceeding. This is neither efficient nor always equitable, especially to the proponent who suffers loss and delay even if the process was duly applied. In most Canadian provinces including BC, it is much more difficult to obtain standing since demonstrable potential impact exceeding that incurred by others must be shown. As such, it fails to be representative of all the affected parties.

New South Wales utilizes the "Land and Environmental Court", a body which is responsible for adjudicating appeals, and which can overrule consents or denials for development or modify their conditions, and can demand an environmental assessment and evaluate it. Any interested citizen or firm can obtain standing in this court if it can be shown that the legislated process may not have been followed or the best alternative or option was not represented or not chosen. There are processes for managing vexatious appeals, that is appeals whose sole purpose is to inhibit or prevent the lawful progression of the project.

In Oregon, the Land Use Board of Appeals (LUBA) is essentially a court which rules on matters involving municipal or urban land use conflicts. Though in this report we wish to deal only with crown land allocation, this municipal process may be readily applied to crown land appeal procedures. LUBA is comprised of three lawyers, appointed by the governor, with extensive knowledge of Oregon's land use procedures. Powers, usurped from the local courts and given to this board, streamline the appeals process to make it more efficient and decisions made have the force of law. Further actions can be taken to the Supreme Court.

Saskatchewan also utilizes an appeal procedure external to the government system. The Lieutenant Governor appoints a Provincial Planning Appeals Board to hear and determine all appeals based on interpretation of Planning and Development Act provisions. Ontario utilizes the Ontario Municipal Board, which hears appeals relating to planning on private land.

The US Bureau of Land Management has an internally mandated process where, for a specific action (part of a plan), an individual can appeal firstly to the decision maker, and then to the Interior Board of Land Appeals, a quasi-judicial board of the Dept. of the Interior for all land uses.

Washington also uses an in-house, sequential, three step appeal procedure 1) to the Public Lands Commissioner, 2) then to the Board of Natural Resources, both of whom review and direct proceedings as they see fit, and finally 3) the courts.

The B.C. Ombudsman's Office, in a brief report in the introductory chapter, suggested the formulation of an appeal system that would comply with the notion of "fundamental justice" as described in section 7 of the Canadian Charter of Rights and Freedoms.[1] Such a system would be accessible to the local communities, be easily understood, be composed of one or a number of members agreed upon by the appellant and the ministry, and would have decision making authority.

Informal Appeal Procedures

Informal processes are usually dependent on the tenacity and persistence of those who wish to appeal a decision. In Newfoundland, such informal appeals, which seldom happen, are normally channeled to the bureaucrats rather than through the politicians, in an effort to maintain a professional approach rather than a political one. On the other hand, in the Yukon, appellants go directly to the minister of the involved department.

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1. British Columbia 1988 Ombudsman: Fairness for all in British Columbia. 1988 Annual Report to the Legislative Assembly. The Queen's Printer

K) ENVIRONMENTAL IMPACT ASSESSMENT

Environmental impact assessment processes and procedures, and their basis in law and policy, vary widely from jurisdiction to jurisdiction. A comprehensive review of EIA in each jurisdiction is beyond the scope of this report.

4.3 PLANNING PRODUCTS

Generally, there are no specific guidelines to the layout of planning products as the plan is moved from one level of bureaucracy to another. Typically, higher levels of government produce general statements, guidelines and overall goals to which the final plans, developed regionally, must conform. Increasing layers of bureaucracy produce plans of increasing detail and specificity at each level.

For example, in Ontario, Cabinet legislates control of resources and land allocation to the Ministry of Natural Resources (MNR). Any other government agency or ministry must request land from this ministry. Allocation is dependent on the Strategic Land Use Plan (SLUP). The process is designed to advance from a provincial to a regional and finally to a local level. The SLUP identifies policies and objectives of MNR programs and is designed to aid in resolving conflicting resource demands. District plans must comply with the regional plans which are subject to the SLUP. The final detailed plans are supplemented by sub-levels (Management Plan, Operating Plan, Work Plan) to ensure the implementation.

When final specific plans pertaining to an area or region have been developed, the plan is returned for approval to a higher level of government. In areas where there is pro-active planning, such as New Zealand, the plans must meet the preset criteria.

In the US Forest Service, principles established by Congress determine principles to be developed by the Chief Forester (which are, in turn, reviewed by Congress). Specific plans are made by the Regional Foresters who use these principles and policies. Unfortunately, final regional harvesting quotas are determined by the national office. This leads to problems and binding situations when regional managers and foresters attempt to apply these quotas to the region. Specificity at higher levels leads to problems on the regional scale.

Oregon displays an interesting feature in its utilization of forested areas and land use planning. Each municipality can determine the fate of forested area within its boundaries. If it chooses to designate the area as forest, the Forestry Dept. will undertake forest planning. But if the municipality chooses to not designate the land as forest land, all forestry activities that generate economic income are precluded.

4.4 STRATEGY OPTIONS

Based on the review, it is possible to identify the following strategic choices or options for each component of the planning process. These options are summarized below in Table 1.

TABLE 1
STRATEGIC OPTIONS FOR CROWN LAND PLANNING

COMPONENT	STRATEGIC OPTIONS
1. Legislative Base	a) Enabling legislation allowing for flexible process.
	b) Detailed legislation providing certainty in process.
2. Jurisdiction and Authority for Preparation of Plans	a) Dominant agency with narrow mandate (ie, forestry)
	b) Dominant agency with broad mandate. (i.e. natural resources)
	c) Interdepartmental Committee or task force with representatives from agencies.
	d) Independent board or committee appointed by government.
3. Jurisdiction and Authority for Approval of Plans	a) Cabinet or Cabinet sub-committee.
	b) Dominant department.
	c) Inter-departmental committee of civil servants.
	d) Independent board.
	e) regional or local government.
4. Initiation of Planning	a) Systematic and mandatory.
	b) Responsive and permissive.
	c) Selective.

5. Public Participation	a) Legislation: i) based in legislation ii) not based in legislation b) Obligation: i) mandatory involvement ii) discretionary involvement. c) Rule: i) Delegation of decision making authority. ii) Advisory role only in plan preparation. iii) Opportunity for participation in formal review (public hearings). iv) Opportunity to comment informally at key points in planning process.
6. Conflict Resolution	a) Special mediation process. b) No special process.
7. Monitoring and Enforcement	a) Comprehensive and incorporated into planning process which either i) allows any interested party to utilize courts to enforce, or ii) allows only government to enforce. b) no comprehensive monitoring and enforcement process.
8. Review	a) Mandatory and comprehensive. b) Mandatory and selective. c) Permissive and responsive.

9. Appeal	a) Appeal Body i) Courts ii) Special appeal body. b) Power of Appeal Body i) Questions of law, jurisdiction and content with power to alter. ii) Questions of law, jurisdiction and content with power to refer back to decision maker. iii) Power to disallow on questions of law and jurisdiction only. iv) Advisory power only. c) Standing i) any party can appeal. ii) appeal only by those significantly affected
10. Planning Product	Content: a) Comprehensive plan allocating land and specifying detailed management practices. b) Comprehensive plan allocating but not specifying detailed management practices. c) Ad hoc plan providing only general policy guidelines. Force: a) Force in law. b) Advisory

4.5 CONCLUSION

The report has described existing planning structures in a number of jurisdictions. The description reveals a wide variation in practice.

Although the alternatives have not been evaluated in this report, they have been used to identify feasible alternatives for structuring the process for forest land planning in British Columbia.

These strategies can now be used to identify several alternative structures which can be evaluated in light of the issues in British Columbia.

Biophysical Analysis in Forest Land Planning:
An Overview and Evaluation

Background Report Prepared for the
British Columbia
Forest Resources Commission

by Chris Fletcher
Natural Resources Program
Simon Fraser University
30 November, 1990

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Section 1. Introduction

One of the most common methods for analyzing land management options is the biophysical overlay approach pioneered by Hills (Hills *et al.* 1970) and McHarg (1969). This approach forms the basis of the Canada Land Inventory and the British Columbia Land Inventory systems and is a commonly used technique for preparing land use plans in British Columbia.

The purpose of this report is to evaluate the effectiveness of biophysical overlay methods in land use planning. The report begins with an analysis of the principles of biophysical classification and land use evaluation. This will serve as a basis for discussion of biophysical planning systems, and assist in formulation of criteria to be used to evaluate currently used methods. The report will conclude with an assessment of the role of biophysical techniques in land use planning in BC.

Section 2. Principles of Biophysical Analysis

2.0 Introduction

All human activities are affected by, and in turn affect, the biophysical environment. The principal purpose of biophysical analysis is to assist in the allocation of land and water resources[1] to appropriate uses. Biophysical analysis is one potential input into the broader land use and management planning process. Figure 2.1 outlines the stages of planning in general, and of biophysical analysis.

The first step in planning is to identify, with the assistance of all affected interests, the issues and scope of the planning process. This includes discussing and choosing land use goals and specific objectives to guide subsequent data collection and evaluation. The first stage also involves defining the study area and the range of prospective land uses to include in the analysis. The second step is to gather information to assist in formulation of alternative policies or plans. These alternatives are then evaluated using criteria developed from the stated goals and objectives. A decision is then made from among the alternatives. Implementation of the chosen alternative involves specifying responsibilities of different interests, and outlining applicable legislation, regulations, and relationships among adjacent land use areas, including appropriate restrictions on use (Luff and Ojaama 1979). Finally, plan implementation is monitored to ensure that objectives are being met.

Biophysical analysis specifically involves information collection and evaluation. However, it has implications for all planning stages. After issues, goals, and objectives are determined, the biophysical analysis begins with collection of the data necessary to classify resources in the study area into units with homogeneous land use capability. These units are then evaluated for each prospective land use. The single use evaluations for the area are then synthesized into a composite evaluation. The composite evaluation could indicate the best

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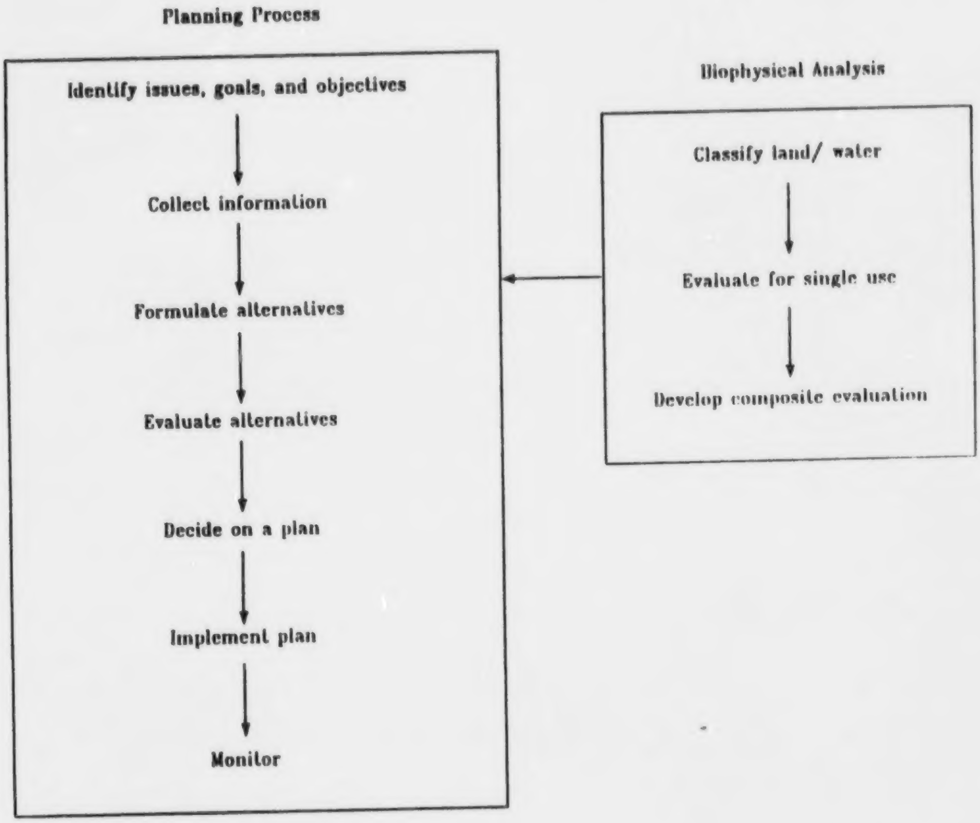
[1] **Both land and water systems must be evaluated for their ability to provide goods and services. In this section, "land" will be used to refer to both terrestrial and aquatic resources.**

Figure 2.1 Stages of Land Use Planning


Planning Process
Identify issues, goals, and objectives
Collect information
Formulate alternatives
Evaluate alternatives
Decide on a plan
Implement plan
Monitor
Biophysical Analysis
Classify land/ water
Evaluate for single use
Develop composite evaluation

Sources: P. Hall (1975: 273); Harrison (1981: 25)

use for each land unit from a biophysical perspective, or possibilities for multiple use based on compatibilities and incompatibilities among uses. The synthesis stage essentially involves generation of alternative land use allocations, and investigation of their biophysical implications. The land use decision uses results of the biophysical analysis and other techniques to choose the land use alternative that best meets social goals and objectives.

The steps of land planning and biophysical analysis are iterative. As each is executed, need for revisions at previous levels may become apparent. Data collection may indicate that initial issue identification was too narrow, goals were unrealistic, or the biophysical classification scheme was inappropriate. Attempts at evaluation may highlight information deficiencies. If monitoring shows that institutional arrangements are blocking objectives, or that the trade-offs (eg. job loss) involved in the plan are higher than anticipated, the planning process may be reinitiated.

The purpose of this paper is to describe and evaluate biophysical classification and evaluation, and to examine their role in the decision making, implementation, and monitoring stages of land use planning. Issue, goal, and objective identification are not discussed in detail; however, these steps are critical to focus and direct planning efforts. Since not all biophysical information may be relevant to the decision at hand, data collection and analysis must be focused to avoid excessive expense. Further, all decisions must be based on criteria developed from stated goals and objectives. Biophysical analysis is one aspect of planning that can assist in meeting and refining, but not in initially identifying, social goals and objectives.

2.1 Biophysical Classification

The goal of biophysical classification is to distinguish homogeneous units which will respond uniformly to land use management actions. The capability of land for different uses depends on interactions among many ecological components: climate, soils, water, bedrock, surface material (eg. glacial till, river and lake deposits), vegetation, and wildlife. Capability analysis requires that land be classified into units with sufficient homogeneity of ecological interactions to allow a single capability rating. In North America, Angus Hills (Hills *et al.* 1970) and Ian McHarg (1969) were important in their recognition that the processes linking environmental components determine how land systems affect and are affected by human uses. Their work is illustrative of two basic approaches to biophysical classification. Hills' approach was to delineate areas based on their biophysical homogeneity, and then to determine the capability for all land uses within these units. McHarg's approach was to delineate areas of homogeneous use capability separately for each land use. The approach chosen will determine data collection strategies, including decisions on which data to collect.

Besides choosing an area delineation technique, planners undertaking biophysical analysis must also decide on the level of detail required. Data scale is therefore another important issue in biophysical analysis, and will be discussed subsequent to area delineation. The following subsection describes the approaches to area delineation.

2.1.1 Defining Homogeneous Areas

Approaches to unit delineation can be rooted in either homogeneity of biophysical attributes (eg. Hills *et al.* 1970), or of land use capability (eg. McHarg 1969).

Methods based on the homogeneity of biophysical attributes use the premise that since ecological processes determine how an area will react to any land use, all uses should be evaluated within the same biophysical units. A common procedure is to divide a study area into units of increasing homogeneity using a hierarchical classification. For example, the entire study area may consist of two generally distinguishable areas. Both of these areas could be further broken down by observing phenomena at more local scales, until a homogeneous site with uniform biophysical features and processes emerges. For example, in a classification described by Wiken (1986), *ecoregions* are defined as areas where regional climate has resulted in broadly similar patterns of vegetation, soil, and wildlife. *Ecodistricts* consist of distinctive patterns of relief, geology, and landforms within ecoregions. Ecodistricts are divided into *ecosections*, based on recurring patterns and ranges of landforms, soil, and vegetation. *Ecosites* are subdivisions of ecosections with fairly uniform soil parent materials, soil development, and hydrology. Finally, *ecoelements* are areas of homogeneous soil characteristics and depth, vegetation successional patterns, and slope within ecosites[2] (see figure 2.2).

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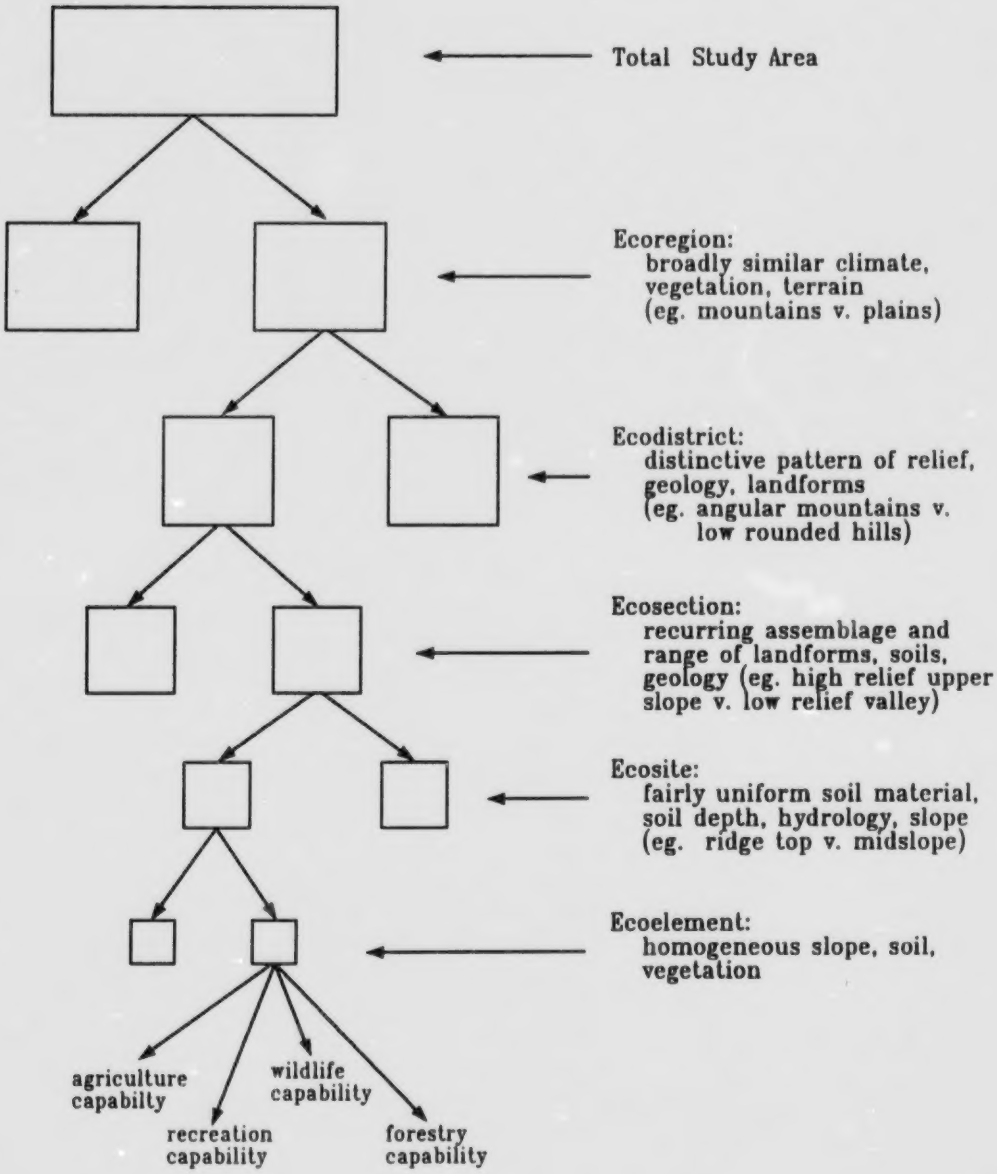
[2] **This nomenclature has developed from that of Hills et al. (1970) and Lacate (1969). The corresponding names proposed by these authors were land region (ecoregion), land district (ecodistrict), land system (ecosection), land type (ecosite), and site phase (ecoelement).**

Figure 2.2 Land capability mapping emphasizing biophysical homogeneity

Steps:

1) Divide land into uniform biophysical areas.
2) Develop evaluative criteria based on the biophysical requirements of each prospective use.
3) Rate each land unit for each prospective land use (all ratings on one map).


Total Study Area
Ecoregion:
broadly similar climate, vegetation, terrain
(eg. mountains v. plains)
Ecodistrict:
distinctive pattern of relief, geology, landforms
(eg. angular mountains v. low rounded hills)
Ecosection:
recurring assemblage and range of landforms, soils, geology (eg. high relief upper slope v. low relief valley)
Ecosite:
fairly uniform soil material, soil depth, hydrology, slope
(eg. ridge top v. midslope)
Ecoelement:
homogeneous slope, soil, vegetation
agriculture capabilty
wildlife capability
recreation capability
forestry capability

Sources: Lacate (1969); Rowe (1979); Canada. FEARO (1980); Wiken (1986).

Units at each level of such a hierarchy can then be rated for their land use capability. Classification may consist of initial disaggregation into ecologically homogeneous units, followed by grouping of some areas into units with similar constraints or opportunities for a land use (Hills *et al.* 1970; Hopkins 1977; Luff and Ojaama 1979).

A broad distinction can be made between *component* and *integrated* biophysical classifications (Driscoll *et al.* 1984; Pojar *et al.* 1987). Component classification consists of separately mapping environmental factors such as soil, vegetation, landform, and water. By overlaying these maps, one can distinguish areas with identical components. For example, the biophysical land classification used by the BC Ministry of Environment during the 1970s delineates homogeneous areas with overlay maps of physiography (major geologic systems like mountain ranges, plateaus, valley systems), vegetation, bedrock and surficial geology, aquatic systems, and soils (Walmsley 1977). Driscoll *et al.* (1984) describe a component classification for the United States, combining soil, vegetation, aquatic, and landform elements.

Some ecologists feel that ecosystems are functional units defined by interactions among biophysical components and cannot be delineated simply by merging similar things (Bailey 1987; Rowe 1980; Rowe and Sheard 1981). Such authors propose a more ecologically based integration of biophysical features and processes, concentrating on how these factors interact to form functional ecosystems. The systems described in Wiken (1986) and Lacate (1969) are integrated classifications (see figure 2.2). The biogeoclimatic system, an integrated classification developed in BC (Pojar et al. 1987), places more focus on climate, vegetation, and soils, and less on landforms when defining ecosystems. Other examples are discussed by Hawes et al. (1976), Rowe and Sheard (1981), and Pattison (1984). The concept of integrated classification is fairly recent. Area delineation criteria within integrated systems are frequently inexplicit (Bastedo and Theberge 1983), or are very complex (eg. Pojar *et al.* 1987).

The second basic classification approach emphasizes homogeneity of capability for a specific land use. Approaches based on land use delineate units differently for each use depending on the specific requirements and tolerances of each activity. One way to delimit units of homogeneous use capability entails mapping each biophysical component according to its suitability for a particular use. For example, a terrain map for agriculture might consist of three classes: relatively flat land good for agriculture; steeper land with some limitations; and land too steep or rugged for agricultural use. Similar maps are constructed for each relevant biophysical factor for each prospective land use. Overlaying the factor capability maps for each land use delineates areas of overall homogeneous capability for that use. Homogeneous units could also be delineated by considering all relevant biophysical factors together as they interact to determine use capability. Different approaches for synthesizing data into composite ratings are discussed in section 2.2.2. Figure 2.3 outlines the land use approach to area delineation.

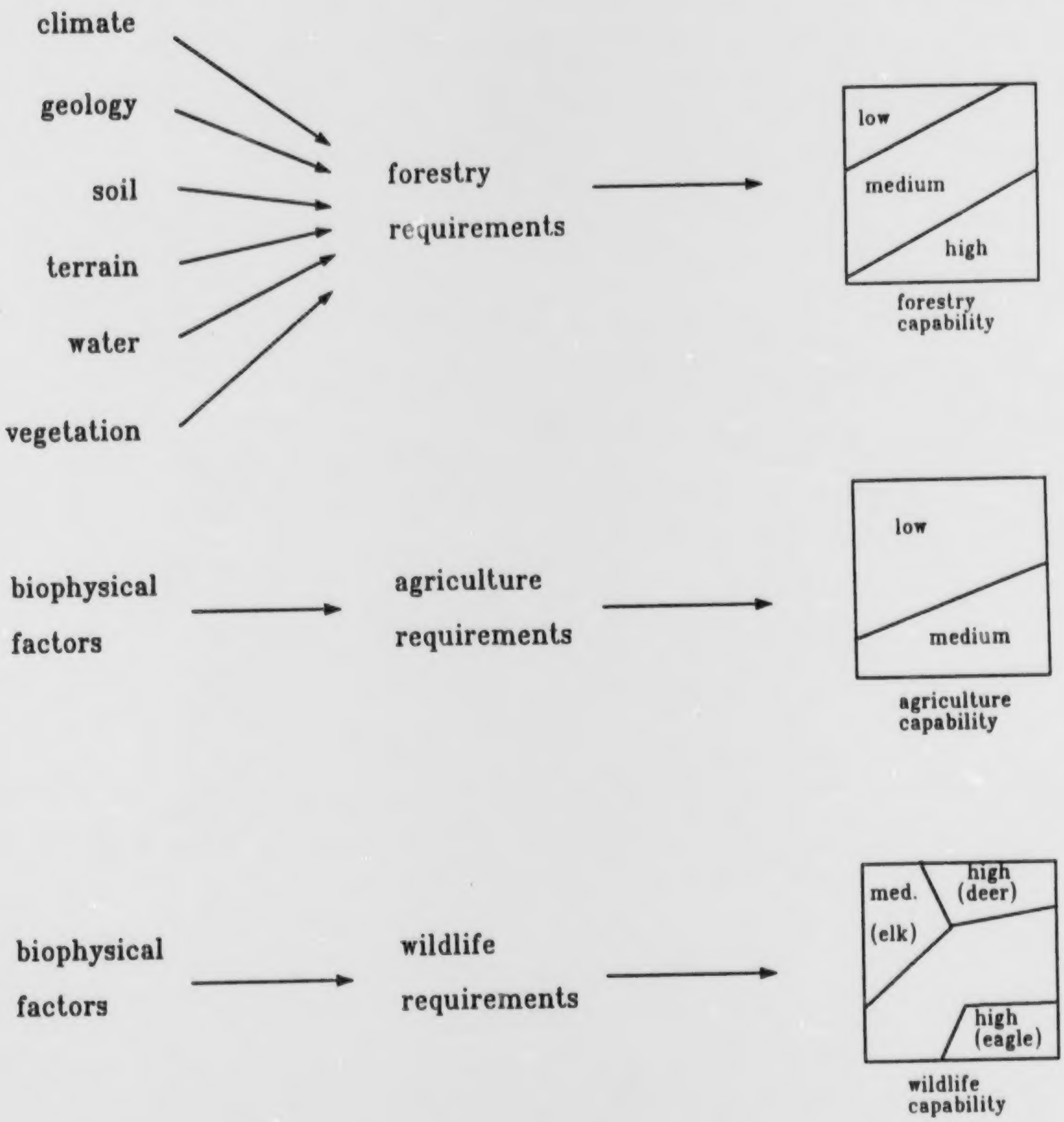
A major difference between area delineations based on biophysical factors and land uses is the degree to which non-biophysical aspects are incorporated. Development of the biophysical area delineation philosophy and methods has focused on the underlying ecological theory. But social, economic, and cultural factors also affect land use (Bastedo *et al.* 1984; Friend 1979; Nelson *et al.* 1988). While it is possible to conceive of a system of fixed biophysical-socioeconomic units, it would be difficult to include all factors important to all land uses. Area delineation based on land use offers more flexibility in this respect.

Gelinas (1986) discusses a method for linking fixed biophysical and socioeconomic units to assist in planning. The "environomic" units combine the ecological land classification of the Canada Committee on Ecological Land Classification (Rowe 1979; Wiken 1986) with the Statistics Canada geostatistical data classification system. Delineation of environomic units requires integration of ecological and socioeconomic data corresponding to units of similar scale to ensure data comparability. Integration of these data early in the planning and classification process also simplifies data collection and presentation (Gelinas 1986), recognizes the roles of human activity in ecosystems (Bastedo *et al.* 1984), and allows monitoring of changes over time (Gelinas 1986).

Figure 2.3 Mapping and evaluation emphasizing homogeneity of land use capability

Steps:

1) Determine biophysical requirements for each prospective land use.
2) Collect data on these factors.
3) Divide land into areas of uniform capability for each prospective use (may involve combining capability maps for each biophysical factor into a composite map).
4) Rate capability of each unit for each use (one map for each land use).


climate
geology
soil
terrain
water
vegetation
forestry
requirements
low
medium
high
forestry capability
biophysical
factors
agriculture
requirements
low
medium
agriculture capability
biophysical
factors
wildlife
requirements
med.
(elk)
high
(deer)
high
(eagle)
wildlife capability

Gelinas uses environomic units to highlight areas of high soil erosion hazard by cross-referencing agricultural practices with patterns of soil moisture, precipitation, and wind. By overlaying this map with one showing agricultural labour distribution, he then outlines areas with high potential for labour displacement due to erosion-induced farm failure.

There are many other possibilities. Industrial activity, environmental pollution, and human health indicators could be cross-referenced to illuminate possible health hazards. Sustainable timber growth (long run sustainable yield) could be compared with current harvest levels and proportion of regional employment in the forest sector to highlight areas where harvest "falldowns" might result in layoffs. Overlaying proposed protected areas and forecasted resource extraction could point to priority areas for studies to determine the likelihood of irreversible loss of ecological resources, or if alternate areas might be available either for ecological conservation or resource extraction.

Bastedo *et al.* (1984) and Nelson *et al.* (1988) describe the ABC system, which incorporates cultural (C) with abiotic (A) and biotic (B) features and processes in describing, analyzing, and developing management frameworks for ecologically sensitive areas. The ABC system recognizes the important effect cultural features and processes, such as settlements, pipelines, transportation corridors, and resource extraction (hunting, logging), can have on biophysical systems. The ABC system therefore involves compilation and integration of data for each category (abiotic, biotic, cultural), while recognizing the need to retain information for specific decision making needs.

Whether the classification focus is on biophysical characteristics or land use requirements, criteria for delineating areas must be determined early in the classification and mapping process. For a purely biophysical classification these could be the vegetation, soil, or landform type. For a land use based classification, criteria might include slope, soil drainage characteristics, and vegetation productivity. Further, criteria are required to determine the range or variability of each feature to be included within each land unit. At larger scales, a biophysical classification unit would incorporate less variability in landform or vegetation type than at smaller scales. In a land use based classification, the analyst may, for example, delineate units by estimating the range of slope over which a given use is impossible, moderately possible, or unaffected.

Gestalt methods use non-explicit rules emanating from experience and a holistic view of the environment to define homogeneous ecological systems (Hopkins 1977). Since the ecological processes linking environmental features are often not quantified, patterns and qualitative features recognized through experience may be used to define distinct ecosystems. The early work of Hills is an example of gestalt classification (Hopkins 1977): Hills provided no quantitative, and only very broad qualitative differentiating criteria. This is particularly true when Hills combined areas initially delineated by biophysical criteria alone into interacting biophysical and human systems of common use capability. The integration process is based on judgement and experience, rather than clear guidelines. The degree to which a gestalt classification reflects ecological reality depends on the experience of the analyst. Further, people with different backgrounds and foci will likely produce different gestalt classifications of the same area, and future users may have difficulty in understanding reasoning behind the classification.

By following explicit rules of combination (Hopkins 1977), different analysts can arrive at similar classifications of an area. Such rules could consist of qualitative criteria, such as tree species, soil type, or landform, or quantitative criteria, such as slope, precipitation, soil depth, or percent tree canopy cover. Increasingly explicit rules improve chances that classifications will be replicable, and comparable among different areas.

Perceptions differ as to which biophysical factors should form the basis of ecological classifications. Climate is most often used to divide land at a broad level into units having fairly uniform biological and physical processes. Vegetation is frequently used to infer climate, since climate data are often lacking (Pojar *et al.* 1987). Landforms are felt by many (Bailey 1985; Rowe and Sheard 1981) to be the best criteria for unit delineation after broad climatic division, since they are stable. Vegetation is a good indicator of ecological processes, but is relatively changeable. However, some important classifications (eg. Pojar *et al.* 1987) are based more on vegetation as an indication of zonal climate than on landforms.

In general, a classification must be judged on its ability to meet the objectives for which it was designed. No one ecosystem typology is better than all others. Ecosystems are human not natural constructs, and are therefore a function of the designer's approach (Whittaker 1978). The classification design process is not simple, nor will it ever be complete. New knowledge and new needs require periodic revisions of classification systems.

Two classifications in BC illustrate that ecosystem delineation is not a trivial, purely technical task with only one correct answer. The biogeoclimatic classification used by the BC Ministry of Forests (MoF) originally had 11 zones (Krajina 1969), then 13 (Pojar 1983), and now 14 (BC MoF 1988a). Accumulating experience showed that different breakdowns would prove more useful for developing management prescriptions. Similarly, the classification being reviewed for the BC Ministry of Parks (MoP) system plan proposes 59 representative landscapes for the province. Landscapes are defined by landform, vegetation, wildlife, climate, and aquatic systems (BC MoP 1990a). The MoP landscapes incorporate visual and scientific criteria. The ecoregion classification of the BC Ministry of Environment (MoE) Wildlife branch currently recognizes 33 ecoregions - areas delineated by ecological factors similar to BC Parks landscapes - and 83 ecosections, based on minor climatic and physiographic variations within ecoregions (Demarchi 1987). Either system could be used as the basis for the BC parks system. The final decision will require consensus among earth scientists, plant and wildlife ecologists, and climatologists. Currently, there is no clear consensus on definitions or mathematical indices on which to base simple solutions for these classification problems.

2.1.2 Scale

Different ecological features and processes at various spatial scales are relevant to different types of land use planning. Therefore, different ecosystems, or parts of them, are of concern to planners. Someone laying out a pipeline may not be concerned with how vegetation, soils, terrain, wildlife, and aquatic flora and fauna form an interacting system. They need to know something about terrain stability and perhaps flood hazard in a relatively local area. For more extensive activities, such as timber harvesting, a broader inclusive view will be necessary to understand the effects of harvesting on wildlife, and the cumulative effects on watershed hydrology. A regional planner requires general information about the types and distribution of activities suitable to the region. Someone planning a single timber harvesting block needs site specific information to determine the volume to be harvested, formulate management prescriptions, and highlight resource interactions. To meet different needs, biophysical classifications must integrate different factors at different scales. Section 3 describes some biophysical classifications used in BC for various planning and management purposes.

Hierarchical classifications, that is, those integrating ecosystems at different scales, help to place smaller systems in their larger context. Homogeneous biophysical units, defined either within a component or integrated framework (see subsection 2.1.1), form a *landscape mosaic* with characteristic processes different from what one would expect by simply combining the processes of the component units. This is because the units themselves interact (Bailey 1985). Understanding the effects of management over space and time, and interactions among land uses, requires an understanding of how individual biophysical factors interact to form homogeneous ecosystems or biophysical units, and how smaller ecosystems interact within larger ones.

Hierarchical classifications attempt to delimit ecosystems at different scales according to the most important determinants of their features and processes (Bailey 1985, 1987). At larger scales, *macroclimate* - broad temperature and precipitation regime - is the major determinant. Classifications which delineate units according to macroclimate are termed *zonal* (Bailey 1985). At smaller regional and local levels, different scales of topography - geologic materials, elevation, aspect, slope - modify the effects of macroclimate (Bailey 1985; Rowe and

Sheard 1981). The classification described in Wiken (1986) shows how climate and topography can be used to delineate increasingly small and homogeneous units (see figure 2.2).

At each scale, the units contain different amounts of variability. Smaller scales (eg. 1:250,000 or 1 cm = 2.5 km)[3] provide a broad idea of biophysical unit characteristics: landform and soil types, predominant vegetation. At larger scales (eg. 1:20,000 or 1 cm = 200 m) one can incorporate much more detail into unit descriptions.

For example, in general, the Pacific coast of BC is, due to moist air and the temperature moderating effects of the ocean, wetter and warmer than the northern interior plateau to the east of the Coast Mountains. These climatic differences have resulted in different soils, landforms, and vegetation. The coastal region topography is generally steeper and more rugged than in the interior, having implications for transportation and industrial activities. Consequently, these two large regions have broadly different economic potential based on natural resources.

Within the coastal region, the shoreline areas have direct interaction with the ocean, while more inland areas receive indirect oceanic effects (wind, moisture) and have different topography. While these subregions interact - shore areas receive eroded material from inland - the interactions are stronger within the subregions than between them.

The inland area is composed of many watersheds which are similar, but again, interactions within a watershed are stronger than between watersheds. Management actions such as logging, mining, or hunting will have far larger effects on the watershed in which they occur than on the coastal area in general. However, the action will have an effect on the remaining resource inventory, and therefore the economy of the region.

The watershed may have one generally north-facing slope and one predominantly south-facing. These two slopes will receive different amounts of sun and rain or snow, and therefore exhibit different soil-forming processes and vegetation growth potential. The same management treatment will have different effects on these slopes.

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[3] **Relative scale size is an inverse function of the number after the colon. 1/250,000 is smaller than 1/20,000. A unit mapped at 1:250,000 will appear smaller than at 1:20,000.**

Each slope is a mosaic of different forest types, wetlands, meadows, and streams. Each patch within the mosaic has different capability for any given land use and will react differently to management actions. But activities in one patch will affect ecological processes in surrounding, and perhaps even more distant patches; for example, if a landslide moves soil into a stream, the effects may be felt further downstream.

Mapping of each of these levels requires use of different scales to provide planners or managers with appropriate detail and information. Different scale maps therefore have their own appropriate uses. Table 2.1 summarizes a general ecosystem hierarchy with common scales and planning uses.

2.2 Land Use Evaluation

After delineating homogeneous land units, the next step of biophysical analysis is to evaluate the ability of these units to support different uses. This subsection first discusses different aspects of evaluation based on biophysical potential, current administrative status, and social and economic factors. It then describes ways of integrating data on different biophysical factors into evaluative ratings for specific land uses. Finally, the synthesis of ratings for each land use into a composite land capability map is examined.

2.2.1 Land Use Capability, Suitability, and Feasibility

The ability of land to provide goods and services depends on the requirements of related land use activities, and on the land's biophysical characteristics. Land can either constrain or facilitate different uses. However, limitations can be removed, and opportunities enhanced through various management actions. Further, socioeconomic factors, such as market location, demand, and input costs affect the advantage to a society of using particular biophysical resources.

Table 2.1 A generalized ecological hierarchy

Unit name	Common map scale and approx. size	Boundary Criteria	Uses
Region[1] (ecoregion[2], macroecosystem[3])	1:3,000,000 to 1:2,000,000 100,000 km^2	Macroclimate Large scale physiography (mountain range, plateau, valley system)	Provincial planning and overview
Landscape mosaic[1] (ecosection[2], mesoecosystem[3])	1:1,000,000 to 1:250,000 1,000 km^2 in large plateau.	Variability within broad physiography: - basins/uplands - different ranges in mountainous region.	Regional strategic planning (economic potential; goal setting)
Site[1]	1:250,000 to 1:50,000 1-10 km^2	Local landform (surficial material bedrock, slope aspect)	General reconnaissance inventory - land allocation
(habitat unit[2], microecosystem[3])	1:20,000 > 1 km^2	Very specific features (slope change, soil depth) or processes (sensitive soils, fish habitat)	Detailed inventory - management prescriptions

Notes:
1. Miller (1978) in Bailey (1985).
2. Demarchi (1990).
3. Rowe and Sheard (1981).

Capability, suitability, and *feasibility* correspond generally with these three aspects of land evaluation (Hills *et al.* 1970). Use *capability* can be defined as inherent productive potential given specified management actions and intensity, and any economically and technically feasible improvements. Use *suitability* is the unit's ability in its current state to produce specified goods and services. This may include current administrative status, as well as physical condition. Use *feasibility* combines capability and suitability ratings with forecasted socioeconomic conditions to rate the advantage of pursuing a certain land use. Capability and suitability are differentiated by the economic viability of overcoming limitations to use. If removal of an existing limitation is affordable, the land would be rated as capable of, but not currently suitable for, producing the desired goods. The degree of effort required to overcome the limitation can be incorporated in a suitability rating (Hills *et al.* 1970).

Some authors use different terms for these concepts (Vink 1980: 202-206), or use terms interchangeably (Steiner 1981). McHarg (1969) felt that ecological characteristics gave *value* to land, which both constrained and facilitated human activities. His evaluation of land suitability for different uses incorporated socioeconomic factors such as distance to manufacturing or population centers. Therefore, McHarg's value and suitability are similar respectively to Hills' capability and feasibility. However, the general concepts as described by Hills *et al.* (1970) suffice in distinguishing the different land evaluation concepts. Land has inherent productive potential (*capability*) for a land use, but its current physical or administrative state may preclude optimum biophysical productivity (*suitability*). Socioeconomic factors may increase or detract from opportunities to use an area (*feasibility*). The remainder of this section focuses on biophysical capability. However, the methods discussed are applicable to suitability and feasibility analysis as well. While land must be biophysically capable before being allocated to any use, suitability and feasibility analysis are also critical in allocating lands to appropriate uses.

2.2.2 Rating Use Capability

Different biophysical attributes of an area may limit or facilitate a particular land use. Beginning with a knowledge of land use requirements, capability ratings can be determined either by evaluating limitations relative to optimum land, that is, with no limitations, or by compiling a list of specific opportunities offered by the area.

Perhaps the best-known Canadian example of a capability rating system is the Canada Land Inventory (CLI). Most ratings in the CLI are based on limitations to use; for example: soil fertility, soil moisture, and slope limitations to agriculture or forestry; food and cover availability for wildlife. Recreation ratings, conversely, are based on specific opportunities, such as beaches, water access, and scenic features. The CLI ratings are for use capability as defined above; that is, inherent productive potential with economically and technically feasible improvements (DREE 1970).

Land use capability is usually determined by the interaction of several biophysical factors. Determining a single capability rating therefore requires either combining ratings of separate environmental components into a summary index, or evaluating combinations of factors for their use capability. An example of the first case is the combination into one index of separate evaluations of slope characteristics and soil stability or productivity. In the second case, slope and soil characteristics would be evaluated together in a way that recognizes the interactions between them. As with area delineation, capability evaluations can be derived using either explicit or non-explicit (gestalt) methods. Gestalt evaluation involves combining separate factor evaluations according to non-explicit, experience-based criteria. However, for users to understand the evaluation, systematic criteria are needed.

McHarg's (1969) approach was to combine separate evaluations of soil, topography, vegetation, surface materials, and climate into a single land use capability rating (Hopkins 1977; Westman 1985). Capability ratings with respect to individual biophysical factors may be combined using various techniques (Hopkins 1977; Smith and Theberge 1986). Hopkins (1977) describes ordinal, linear, and non-linear methods.

An *ordinal* scale is one in which the classes are ranked, but are not separated by consistent intervals. For example, soil characteristics could be rated in a 7 class system, with class 1 being of better quality than class 2, and so on. The difference between class 3 and 2, however, is not equivalent to the difference between class 2 and 1. An example of ordinal combination is the overlaying of maps shaded according to the use capability of each unit: no shading for no limitations; darker shades for increasing limitations. The resultant map theoretically shows areas of high (white or light), and of poor (dark or black) potential. This is equivalent to adding ratings for each biophysical factor. For example, land unit A might have a soil rating of 5 out of 7, and a terrain rating of 3, while unit B has ratings of 2 and 6, respectively. One could conclude, through ordinal combination, that the units are of equal capability. However, this constitutes inappropriate mathematical manipulation of ordinal numbers (Hopkins 1977; Smith and Theberge 1987). The intervals between numerical scale ratings (for instance, from 1 through 7) derived by ranking qualitative land characteristics, or descriptive terms (good, medium, poor) are not necessarily equivalent, and therefore ratings cannot be added, subtracted, multiplied, or divided. Ordinal addition ignores this issue of the potential unequal distance between capability classes.

Another drawback of ordinal combination is that it does not account for interactions among ecological factors in determining use capability. That is, for example, the effect of slope on use capability is assumed to be the same regardless of the soil or surface material present. Slope stability, however, is normally a function of the interplay between steepness and underlying material. In general, biophysical factors interact as parts of interacting feedback loops. For example, climate affects soil development and plant growth; plant growth affects soil development and vice versa. Plant growth may affect the nature and amount of precipitation reaching the ground, thereby further affecting soil development. It is not as simple to separate the effects of ecosystem factors from one another as ordinal combination assumes.

Linear combination methods attempt to overcome one shortcoming of ordinal combination by transforming factor ratings to a scale of equal intervals. This is done by transforming ratings to a percentage of some reference, or equally dividing the possible range of values, for example, rainfall, or density of soil nutrients,(Hopkins 1977). Weights can then be used to alter factor ratings according to their relative importance. For example, soil characteristics may be more important than slope in deciding capability for a given use. Therefore, soil ratings could be multiplied by a higher factor than slope ratings. Adding weighted ratings then results in an overall capability rating. Figure 2.4 outlines the basic steps in weighted factor addition (Canada. FEARO 1980), and provides two hypothetical examples, one evaluating commercial forestry feasibility, the other evaluating conservation quality.

Addition of linear scale ratings for each biophysical component assumes that each factor affects use capability independently, and therefore ignores factor interactions, as does ordinal combination. It also assumes that equal changes in biophysical factors affect land use capability equally. For example, if area A receives 10 cm less rain than area B, linear combination assumes that the difference between the agricultural capability of area A and B would remain constant regardless of whether area B receives 50 cm or 200 cm. This is not a valid assumption; capability often changes in a non-linear fashion. Agricultural capability may increase significantly as rainfall increases from 20 cm to 30 cm, but hardly at all as it increases from 100 cm to 110 cm.

Non-linear combination techniques attempt to overcome the questionable assumptions of linear combination by acknowledging environmental interdependence, and non-linear effects (Hopkins 1977). Both of these considerations may be incorporated into ratings if the mathematical relationship between factors is known. For example, runoff and soil loss can sometimes be determined given plant cover, slope, and watershed form (Hopkins 1977). However, few interactions are sufficiently well understood to allow accurate non-linear combination in developing capability classifications.

One way to overcome the limitations of combining separate factor ratings is to develop *rules of combination* (Hopkins 1977). Such rules define capability classes using

Figure 2.4 Weighted factor addition

1) Determine important biophysical factors and a representative variable which affect land use capability.
2) Weight the factors according to their relative effect on use capability. Weights should total to 100%.
3) Rate each factor on a common interval scale, eg. 1-10, 1 being the lowest quality, 10 being the highest.
4) Multiply weighs by the corresponding rating.
5) Determine class number by dividing the 0-100% scale equally into the desired number of classes.

Class Definitions:

(1)	81-100	**(3)**	41-60	**(5)**	0-20
(2)	61-80	**(4)**	21-40		

Example 1: Rating an area for commercial timber operation.[1]

Factor	Variable	Weight (%)	Rating (1 - 10)	Weighted Rating (%)
Productivity	Soil fertility	30	6	18
Operability	Slope/Relief	30	4	12
Disturbance to fish/ wildlife habitat	Possibility of slope failure/ stream sedimentation	20	5	10
Market Access	Distance to mill	20	4	8
				48 (Class 3)

Example 2: Rating an area for conservation.[2]

Factor	Variable	Weight (%)	Rating (1 - 10)	Weighted Rating (%)
Urgency	Presence of rare species	40	7	28
Viability	Area size	20	4	8
Current protection	Representation in parks system	40	6	24
				60 (Class 3)

Notes:
1. Hypothetical example based on McHarg (1969: 140)
2. Hypothetical example based on discussion in Gotmark *et al.* (1986).

explicit criteria for one or more biophysical components. For example, agricultural capability may be deemed to depend on slope, soil permeability, and subsurface material as they mutually affect machinery effectiveness, slope stability, and susceptibility to soil erosion and compression. These factors could be combined into two classes. High capability areas could be defined as those with slope less than 25%, and with slope greater than 25% combined with either well-drained soil or non-clay subsurface material. Low capability would occur where slopes greater than 25%, poorly-drained soils, and a clay subsurface coexist (adapted from Hopkins (1977)).

In another example, Ferguson (1981) overlays maps of slope aspect, slope gradient, distance from ridge tops, and soil depth to delineate homogeneous topographic land units. Combining this information with equations linking topography and soil characteristics with tree growth (ie. site index) he then estimates the biophysical capability of each unit for timber production.

Evaluations based on combinations of environmental factors recognize implicitly the interactions among factors. Judgement is used in developing the rules and corresponding capability classes, but the criteria are explicit, and allow subsequent users to evaluate the assumptions critically.

The Federal Environmental Assessment and Review Office guidelines for ecological analysis (Canada. FEARO 1980) describe different approaches to defining capability classes with rules of combination including: the presence or absence of a single factor; the number and type of limitations (figure 2.5); and sorted-factor analysis or a hierarchical decision tree similar to the agricultural and forestry examples given above in which several biophysical factors are considered together (figure 2.6).

Rules of combination using presence or absence criteria can minimize the number of land units to be rated. For example, if a particular land use could not occur on slopes over 40%, such areas would not have to be subdivided according to other characteristics. All areas of slope greater than 40%, regardless of soil, vegetation, or geology, would receive a poor rating.

Provided the rules are relatively simple, an overlay system is helpful in allocating areas to different uses. For example, one could outline a general area with timber of adequate size for commercial use. Rules of combination might be: all areas with fish spawning habitat, crucial ungulate winter range, and shallow soils on slopes over 80% will be excluded from timber harvesting. Overlay maps could then be used to locate such areas within the potentially commercial forest, and therefore assist in meeting non-timber resource objectives, while delimiting areas for timber harvesting.

Rules of combination attempt to deal with interactions among biophysical components. However, they do not account for interactions among different land units (Westman 1985). This is a shortcoming of current ecological theory and knowledge. As the understanding of ecological interactions among the biophysically distinct components of a landscape develops, evaluative rules for rating overall land use capability according to interactions between uses in adjacent areas may follow.

2.2.3 Deriving Composite Capability Maps

After the potential for each land use is evaluated for the entire study area, these ratings can be synthesized into a composite land use map. Such a map might indicate the best prospective use for each unit in the area together with compatible secondary uses (McHarg 1969: 145). Alternatively, the map could distinguish areas capable of supporting only a single use, from those capable of supporting several (Belknap and Furtado 1967; Canada IANA 1973). Maps recommending best uses must show clearly the criteria used for the decision. The second type of map is useful in pointing out areas of potential conflict requiring further analysis of the potential for multiple use, or the need for trade-offs.

Multiple use is one of the more controversial land use planning concepts (G.R. Hall 1963; Daniels 1987). The basic premise of multiple use is that land should be used to meet as wide a spectrum of social demands as possible. Management methods which allow multiple

Figure 2.5 Added factor analysis

Example: defining land capability classes for commercial forestry[1]

Potential limiting factors:

Climate: - drought or low temperature
- maritime exposure

Soil moisture: - deficiency or excess

Soil depth: - shallow soil over bedrock
- rooting depth restricted by consolidated layer (eg. glacial till)

Other soil factors:
- periodic inundation
- low fertility
- high levels of toxic chemicals
- active erosion
- stoniness

Class definitions:

Class 1: no limits due to toxic chemicals or stoniness; 1 of others.
Class 2: 2 limitations due to climate, soil moisture, soil depth, or fertility.
Class 3: 3 or 4 limitations due to climate, soil moisture, soil depth, or fertility.
Class 4: soil moisture limitations, plus 2 limits due to climate, soil depth, soil chemicals, or fertility.
Class 5: soil moisture limitations, plus 3 or 4 limits due to climate, soil depth, soil chemicals, or fertility.
Class 6: shallow soil over bedrock and soil moisture limitations, plus 1 of soil fertility, toxic chemicals, or stoniness.
Class 7: extremely shallow mineral soil, regular flooding, or toxic chemical levels.

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[1] Based on the Canada Land Inventory land capability classification for forestry (Environment Canada 1970)

uses can both increase social welfare, and decrease conflict relative to single use land allocation. However, not all land uses are compatible. The trade-offs necessary for multiple use may decrease the value of pursuing incompatible uses in the same area, and a single use allocation may be required. For example, tree farming and wilderness are not compatible. To undertake any timber harvesting would likely compromise any wilderness values. Conversely, retaining landscape aesthetics such that harvesting activities are not visible may make timber

Figure 2.6 Sorted factor or decision tree combination

Example: Forestry capability rating based on factors affecting tree growth[1]

Aspect	Soil Depth (m)	Distance From Ridgetop (100% = ridge to valley)	Slope (%)	Capability 1 - high 7 - low
South	0 - 0.3	0 - 20%	0 - 40	5
			40+	7
		20 - 100%	0 - 40	5
			40+	6
	0.3 - 1.0	0 - 20%	0 - 40	4
			40+	7
		20 - 100%	0 - 40	3
			40+	5
	1.0+	0 - 20%	0 - 40	3
			40+	4
		20 - 100%	0 - 40	2
			40+	4
North	0 - 0.3	0 - 20%	0 - 40	4
			40+	6
		20 - 100%	0 - 40	3
			40+	5
	0.3 - 1.0	0 - 20%	0 - 40	3
			40+	6
		20 - 100%	0 - 40	2
			40+	4
	1.0+	0 - 20%	0 - 40	2
			40+	3
		20 - 100%	0 - 40	1
			40+	3

1. Hypothetical example adapted from Ferguson (1981).

development too expensive to be feasible. Therefore, to determine the potential for multiple resource use to provide more social values[4] than single use allocations, it is important to examine the compatibility of different uses on a given piece of land.

Biophysical classification can assist in examining the physical capacity of land to support different uses simultaneously or in succession. In a study of the Potomac River basin in the north-east United States, McHarg (1969) constructed three matrices to examine the potential for multiple use (figure 2.7). Two matrices cross-referenced land use with ranges of environmental factors (soil types, slope, hydrologic regimes, access, climate) to illuminate the biophysical requirements of each use, and with environmental consequences (erosion, flooding, pollution). Observation of potential conflict or complementarity among biophysical requirements, including possible ill-effects, allowed construction of a land use compatibility matrix. This information was then used to locate potential multiple use areas by comparing the characteristics of biophysical units with the compatibility matrix.

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[4] **Including social demands to protect non-human values such as wildlife, fish, or ecosystems.**

Figure 2.7 Land use compatibility matrices.

		Intercompatibility of Land Uses																	Natural Determinants											Environmental impacts			
		Residential	Industrial	Mining			Agriculture		Forestry			Recreation					Water Management		Slope			Vehicle accessibility	Soils				Aquifer recharge areas	Water supply dependability	Climate (temperature extremes)	Air pollution	Water pollution	Stream sedimentation	Hydrology (floods, drought)
				Shaft-mined coal	Opencast coal	Sand and gravel	Row crops	Livestock	Even-age softwood	Uneven-age softwood	Hardwood	Saltwater	Freshwater	Wilderness	General	Cultural	Reservoir	Watershed	0-5%	15-25%	over 25%		Gravels	Sands	Loams	Silts							
Residential		1																	1	2	3	1					3	1	3	2	3	4	4
Industrial		4	1																3	4	4	1					4	1	3	4	4	3	4
Mining	Shaft-mined coal	4	1	1															2	1	2	1					4	1	1	1	3	3	1
	Opencast coal	4	1		1														1	1	3	1					4	1	1	1	4	4	3
	Sand and gravel	4	1			1													1	3	4	1	1				1	2	1	4	1	2	2
Agriculture	Row crops	2	2	2	4	4	1												2	4	4	1	4	1	1	1	4	1	4	1	4	4	2
	Livestock	2	3	2	4	4	1	1											1	1	2	2	3	2	1	1	1	3	2	1	2	2	2
Forestry	Even-age softwood	4	4	2	4	4	4	3	1										1	2	3	2	1	1	1	1	1	4	2	1	1	3	2
	Uneven-age softwood	3	4	2	4	4	4	4		1									1	1	1	3	2	1	1	1	1	1	1	1	1	1	1
	Hardwood	3	4	2	4	4	4	2		1	1								1	1	1	3	2	2	1	1	1	4	1	1	1	1	1
Recreation	Saltwater		4		4	4						1										2						1	1	1	1		
	Freshwater	1	4	4	4	1	3	2	2	1	1		1									2					1	1	1	1	1		
	Wilderness	4	4	3	4	4	4	3	3	1	1	1	1	1								4					1	4	1	1	1	1	1
	General	4	3	3	4	2	3	2	3	1	1	1	1	1	1							2					1	4	1	1	1	1	1
	Cultural	2	4	4	4	4	3	2	3	1	1	1	1	1	1	1						1					1	3	1	1	1	1	2
Water Management	Reservoir	3	2	4	4	4	4	3	3	1	1		1	1	1	2	1		4	2	1	4				4	1	1	1	1	1		1
	Watershed	4	4	4	4	4	4	3	4	1	1		1	1	1	2	1	1				4		1	1	1	1		1	1	1	1	1

1 - fully compatible	1 - fully compatible	1 - good
2 - medium compatibility	2 - medium compatibility	2 - fair
3 - low compatibility	3 - low compatibility	3 - poor
4 - incompatible	4 - incompatible	4 - bad

(Adapted from: McHarg 1969: 144)

Multiple use evaluation could also involve clarifying which environmental factors could result in conflict between uses. Knowing the relevant environmental components, managers may be able to design activities to minimize negative interactions. For example, timber harvesting could be designed to minimize aesthetic impacts in scenic corridors; timber or mineral extraction could be located and timed to retain adequate severe winter wildlife habitat. These latter cases illustrate where land management, as opposed to land allocation, may be able to minimize conflict. Biophysical classification can assist in outlining areas where sensitive management may preclude the need to make exclusive land use allocations.

Two examples will illustrate how composite biophysical evaluations can provide an understandable method for highlighting the spatial distribution of different resource values, and thereby assist in allocating land and reducing conflict.

In the Columbia River basin in the US Pacific Northwest, the Northwest Power Planning Council (NWPPC) is mandated to integrate demands for hydroelectric development with those for protection of fish and wildlife habitat during power planning (Curtis 1988). The different stakeholders involved in these river basin issues, such as small hydro developers, energy planning agencies, water user associations, fish and wildlife groups, and Indian tribes, were invited by the NWPPC to outline important areas for their respective resources on maps of the basin. One NWPPC goal was to avoid loss of any important fish or wildlife habitat to hydro projects. The planning process resulted in reservation of over 70,000 kilometers of waterways in the Columbia basin from hydroelectric development (Curtis 1988). While substantially restricting the potential number of areas for development, this planning process also highlighted areas where hydro developers could proceed without further opposition from other interests. The construction of a composite map of potential hydroelectric sites, and important fish and wildlife habitat therefore provided the various stakeholders with a clear method for articulating their values, and for observing the relationships among these different values. The maps facilitated meeting the goal of protecting habitat, and reducing chances of future conflict.

Careless (1990) used compatibility matrices to illuminate potential land use conflicts when rating areas for outdoor recreation development. In this study of the Whistler corridor, high conflict potential between recreation and other land uses, such as forestry, wilderness, and wildlife habitat, was used as a basis for deleting potential recreation developments from further consideration. A moderate conflict potential rating indicated potential for management actions to enable multiple uses. Low conflict meant that recreation development could continue without interfering with other land uses. Both McHarg (1969) and Careless (1990) concluded that linking land uses with their biophysical requirements can decrease conflict by helping to locate activities in optimum areas. Since many activities have different needs, they will best be located in different areas, and therefore need not conflict. Activities with similar needs can be located on the same land if compatible, or they can be separated in space if incompatible. By making biophysical needs and compatibilities explicit, rational planning can allocate land to different uses and avoid conflicts which result from less-informed development.

2.3 Land Use Decision Making

Faced with a composite land use evaluation map, the decision maker can finally decide on a land use plan for the study area. The basis of any decision must be a set of criteria or objectives against which to compare land use alternatives. A set of objectives might include, for example, a specific timber harvest, amount of livestock forage, and number of visitor days of recreation potential. Planners could then examine alternative land use combinations shown as biophysically possible on the composite evaluation map. By comparing these alternatives to the stated objectives, the decision maker would choose the best land use combination.

Normally, biophysical objectives are themselves the outcome of a decision making process involving trading-off demands for various biophysical, social, and economic factors. Decision makers are asked to integrate demands for timber, wildlife and fish habitat, recreation, ecosystem preservation, biodiversity, livestock range, agriculture, and community water supply. Biophysical analysis provides information for making decisions once a balance is struck among these disparate objectives. It offers no simple methodologies or summary indices with which to perform such trade-offs.

More so than other stages of land use planning, the decision making process is frequently unsystematic. Documentation of reasoning is an important aspect of decision making. To facilitate monitoring the success of the plan in meeting specific objectives, reasons for decisions should be clearly stated. Further, use of results of the plan normally requires knowledge of the basis for decisions. However, while the reasoning and assumptions used in progressing from an outline of biophysical capabilities and potential resource conflicts to a decision may be technically sound, they are frequently not documented. To be most useful, documentation should outline how different aspects of the plan address specific objectives. For example, how will a particular timber harvest level help to meet socioeconomic objectives for employment or government revenue? Further, the trade-offs involved in following the chosen plan rather than any of the alternatives should be documented. For example, what are the differences in regional economic and recreational benefits among alternative land use allocations? Why is one set of benefits preferable over the others? Clear documentation of rationale for decisions is important both to facilitate monitoring, and to enable use of plan documents in future planning exercises.

2.4 Implementation and Monitoring

Successful land use planning requires that responsibilities of the various interests involved are explicitly delineated. It also requires that a monitoring and evaluation mechanism is in place. A land use plan may be excellent from a biophysical perspective. However, if the administrative framework is not appropriate, objectives may be frustrated, and work of different interests may conflict or overlap (Vreeswijk 1985).

Monitoring is necessary to ensure that the implementation strategy and administrative arrangements are adequate, that objectives are being met, and that the objectives actually serve to further social goals. For example, a land use plan may prescribe deferment of logging in part of a watershed to preserve deer winter range. A monitoring program might check that:

1) protecting winter range actually increases survival of deer;
2) that the specific areas protected serve as good winter range;
3) that management responsibilities were accorded to the most appropriate agencies or individuals; and
4) that the actual trade-offs resulting from the decision (eg. job loss) are similar to those predicted during decision making.

Both biophysical dynamics and limited ecological knowledge mean that decisions made now may not be good in the future, or simply might be wrong from a scientific perspective. A monitoring mechanism is crucial to ensure that biophysical plans keep up with changing conditions and new scientific knowledge.

2.5 Geographic Information Systems

Geographic information systems (GIS) are technologies for storing, retrieving, manipulating, and displaying information on the spatial distribution and attributes of ecological or socioeconomic variables. Current usage normally implies computerized systems (Gelinas 1986). Conceptually GIS offers nothing new. Its power is its ability to manipulate, analyze, and display data rapidly using sophisticated computer technology and programming.

Before computerized GIS, integration of ecological information was a laborious, manual task. Computers facilitate the overlaying or correlating of data in numerous permutations. One can therefore quickly differentiate biophysical units by overlaying ecological factor maps; search for areas where two or more biophysical features or processes coexist to help derive land use evaluations or expose potential conflict; and quantify the implications of land allocation decisions, for example, the timber volume lost to commercial harvesting through reservation of an area for wildlife habitat. Computers also allow easy updating of information, and rapid compilation and output of maps or data tables for the different combinations of biophysical features or land allocations explored during analysis.

Combining the data manipulation capabilities of GIS with remote sensing data may increase the ability to keep biophysical inventories up to date. However, all remotely-sensed data are not sufficiently accurate for all resource management decisions; for example most satellite information is not accurate enough to differentiate among tree species for forest classification, but can distinguish among different cover types such as grassland, deciduous forest, and coniferous forest (Herbig *et al.* 1986; Morin *et al.* 1986). For some uses, such as inventorying areas under different vegetation cover or land uses (recently harvested areas *versus* older forest), remote sensing may allow more frequent inventory updating than would manual field collection.

Up to date resource inventories are particularly important for decisions that rely on both biophysical and socioeconomic variables. Change in both socioeconomic factors (prices, wages, interest rates) and biophysical resources (timber volume available, certainty of mineral reserves, presence of wildlife) could affect decisions in many ways. For example, a drop in wood prices combined with an insect infestation that decreased merchantable wood volume may make timber development uneconomic. Or, finding that a forest stand proposed for logging is the last good elk winter range in a watershed, because an alternate area was destroyed in a recent disease outbreak, may tip the balance in favour of not logging. GIS and possibly remote sensing data could be used to incorporate biophysical and socioeconomic changes into databases, and ensure that decision making is based on current information.

Modelling of landscapes over time is possible with GIS. Attribute data can be assigned time-dependent values rather than static or "snapshot" measurements (Herbig *et al.* 1986). Further, interrelationships between ecological factors, if known, could be incorporated in to the GIS data. For example, change in vegetation could result in change in runoff, or in wildlife use. GIS could, therefore, facilitate interim updating of related ecological factors until field studies were possible, as well as account for ecological interactions.

Using a GIS, Eng *et al.* (1990) incorporate time into the study of the dynamics of severe winter ungulate range in BC. They overlay information on current habitat status, planned logging, and projected forest growth to monitor the quantity and location of different habitat types over a 30 year period. While this exercise may be conceptually possible without a GIS, it is not practically feasible.

In essence, GIS consists of sophisticated overlay technologies. Theoretically, these technologies could be used to combine information in ordinal, linear, or non-linear fashions. They can facilitate planning discussions by showing the spatial relationships among resource values. When knowledge is sufficient, GIS can also assist in the analysis of ecological or land use interactions, such as water runoff changes due to timber harvest, or timber volume deferred from harvest for wildlife habitat. However, beyond delineation of spatial relationships, GIS is subject to the same limitations as all data combination techniques, as discussed earlier (subsection 2.2.2).

2.6 Case Studies

This section describes two examples of resource planning incorporating biophysical analysis. The first example, the Tsitika watershed integrated resource plan, illustrates a land use focused analysis. The second case, a plan prepared for the vicinity of Grande Prairie, Alberta, emphasizes delineation and evaluation of homogeneous biophysical land units.

2.6.1 Tsitika Watershed Integrated Resource Management Planning

The Tsitika River watershed has been the focus of controversy since at least the early 1970s (Vreeswijk 1985). Following public pressure to preserve part of northern Vancouver Island from timber development, and a BC Fish and Wildlife Branch proposal in 1972 to place the entire watershed in an ecological reserve, the Environment and Land Use Committee (ELUC) of cabinet placed the Tsitika under a resource development moratorium. In 1977, ELUC formed the Tsitika Planning Committee (TPC) consisting of representatives from government agencies, the forest industry, labour unions, and a public interest group to decide on an integrated resource management plan for the area. This plan was approved by ELUC in late 1978. Debate still surrounds land use and management in the Tsitika. This is symptomatic of two things: firstly, the limits on current ecological knowledge, and secondly, the difficulty of reaching lasting consensus on land use and management goals. The initial Tsitika plan remains a good example of how biophysical analysis can assist integrated resource planning; it is not meant as an illustration of the definitive planning process.

At the inception of the Tsitika planning process, ELUC instructed the TPC to identify management objectives, and formulate a 6-year road development and timber harvesting plan (TPC, 1978). Planning involved seven basic steps (TPC 1978: 6):

1) Determination of guiding objectives;
2) Inventory of biophysical resources;
3) Mapping each resource to show productivity, capability, and sensitivity;
4) Development of specific management objectives for each resource, and prescriptions to minimize negative impacts of resource development;
5) Resolution of land use conflicts through both technical inquiry and public consultation;
6) Approval by ELUC; and
7) Implementation.

The ELUC decision that some timber harvesting should occur in the Tsitika within an integrated management arrangement, and that public involvement should be sought, necessarily influenced TPC's formulation of its guiding objectives. These were (TPC 1978: 7):

1) To ensure a sustained timber harvest;
2) To maintain fish, wildlife, and recreational resources, and set aside representative ecological areas; and

3) To minimize adverse impacts of logging, and where possible, enhance resource values.

Inventories and maps were prepared for forest cover, wildlife and fish habitat, recreation, terrain, and ecosystems (biogeoclimatic units).

The timber inventory included a breakdown, by commercial tree species, of wood volume, stand height, and stand age. The forest cover map therefore outlined areas of varying capability for timber harvesting.

Wildlife data included estimated populations of deer and elk, and a list of other species inhabiting the watershed, including wolf, cougar, bear, furbearers, and birds. Seasonal habitat characteristics and locations for deer and elk, including some critical areas were outlined. An important consideration, above simple delineation of high capability wildlife areas, was the spatial and temporal distribution of habitat needs. Deer and elk require different types of habitat for different reasons (forage, cover, escape). This aspect of wildlife needs was difficult to map, since locations of habitat types changes over time. Nevertheless, this knowledge was important in designing the land use plan.

Fisheries data were similar to those for wildlife: estimated populations for salmon and trout species; presence of other species; and locations of sensitive fish habitat.

The recreation inventory included information on both limitations and opportunities. Climatic (fog, cool temperatures, abundant rain) and hydrologic (flooding) limitations were noted, along with opportunities for fishing, hunting, canoeing, ski touring, hiking, and viewing.

Terrain classification involved mapping of surface materials (eg. glacial or river deposits, landslides, rockfalls), followed by interpretation of hazards and opportunities associated with the materials. Terrain hazards included potential for post-logging slope instability, high susceptibility to erosion resulting in stream sedimentation, road instability due to drainage problems, and possibility of avalanches or rockslides. Examples of opportunities were sand and gravel sources or well drained, stable areas for road construction.

The biogeoclimatic classification (Pojar *et al.* 1987) was used to map the watershed ecosystems. These were divided into treatment units for which silvicultural prescriptions - tree species selection for regeneration, site preparation (slash burning) - were developed.

Resource maps were then overlaid to highlight locations of potential conflict. For example, overlaying the wildlife and forest cover maps showed areas with both high quality deer winter range and high quality timber. Conversely, overlays could outline areas with high quality wildlife habitat, but low timber values.

The spatial correspondence of resource values illustrated through overlays, and other knowledge such as spatial and temporal requirements of wildlife and compatibilities between land uses, were considered in light of the guiding objectives listed above when deciding on a proposed land use plan. The plan document (TPC 1978) includes discussion of the interactions between the different resource uses: forestry-wildlife; fisheries-forestry; fisheries-wildlife; recreation-forestry; ecological reserves-forestry-recreation. It then lists recommendations that attempt to integrate the various objectives, and also discusses some of the trade-offs among objectives implied by the proposed plan.

For example, assuring both appropriate spatial and temporal distribution of, and minimum damage to, deer and elk habitat required that logging blocks be spread more widely in the drainage than would be done in absence of wildlife concerns. The wider distribution of logging in turn required construction of a large road network. Further, it was felt by wildlife specialists that reservation of winter range necessitated longer timber rotations (time between successive harvests) in 1750 hectares of the watershed. The extended rotation meant deferral of logging for 150 years in these areas, resulting in a 10,560 m^3 decrease in allowable annual cut. Calculations based on Statistics Canada labour productivity data (m^3 harvest/ person-year of employment) showed this AAC drop would lead to a loss of 42 direct (forestry), indirect (milling), and induced (service) jobs. Finally, recognizing the possibility of wind or fire damage to the reserved habitat areas, alternate areas were set aside for 20 years. No AAC reduction was applied to the alternate areas.

Potential impacts of timber development on fish habitat, primarily through stream sedimentation from road building, were exacerbated by wildlife habitat protection requirements for a more extensive road network. To minimize this damage, the TPC proposed windfirm buffer strips along sensitive fish habitat, close monitoring of road construction, and minimizing road construction within the constraints provided by wildlife habitat concerns.

For the most part, negative interactions between recreation and timber harvesting were thought to be minimal. Most recreation opportunities were located in areas with low timber values. The major concerns surrounded visual impacts of logging and construction of a log sort[5] in the Tsitika estuary. In areas of visibility from Johnstone Strait and the North Island Highway, logging was to be planned according to landscape techniques. Development in the estuary remained an unsolved issue; the TPC recommended further studies to investigate biological and recreational impacts of the proposed log sort.

Finally, the plan document included a discussion on the potential impacts of both logging and recreation on areas reserved as representative ecosystems. Logging could have indirect impacts by affecting hydrology and microclimate on nearby areas. These impacts would be minimized through site specific prescriptions and establishment of windfirm reserve boundaries. Intensive or consumptive recreation activities (large campgrounds, hunting) could directly affect ecological reserves, and were therefore to be excluded in reserved areas.

All of the above considerations and recommendations were used to help formulate a 6-year timber harvesting and road building plan, and a land use summary map. Table 2.2 summarizes the composition of the resource value folio, logging development, and land use maps. The land use summary map is shown in Figure 2.8.

In some cases, trade-offs among uses could be minimized by recognizing areas capable of meeting several demands. For example, firebreaks to protect timber, wildlife winter range, buffers between logging and fish habitat, and ecological reserves could in some cases be combined within the same area. Loss of productive forest for timber harvesting was further decreased by consolidating deer winter range into fewer high quality areas, rather than more numerous dispersed ranges.

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[5] A log sort is an area where logs are brought after harvesting to be organized for further transport to mills or markets.

In the Tsitika watershed planning process, biophysical information was used to assist in meeting objectives defined by the provincial government and refined by the TPC. Biophysical analysis and map overlays helped to point out areas of critical values to wildlife, fish, recreation, and ecosystem preservation. They were also used to highlight areas requiring special attention during timber harvest planning to ensure that sensitive soils, fish habitat, and ecological reserves would not be damaged. Linking the timber inventory with socioeconomic data allowed quantification of the trade-offs involved in reserving productive forest from harvesting. Conversely, knowledge of wildlife, fish, and recreation needs or demands facilitated determination of the non-economic values potentially lost by logging.

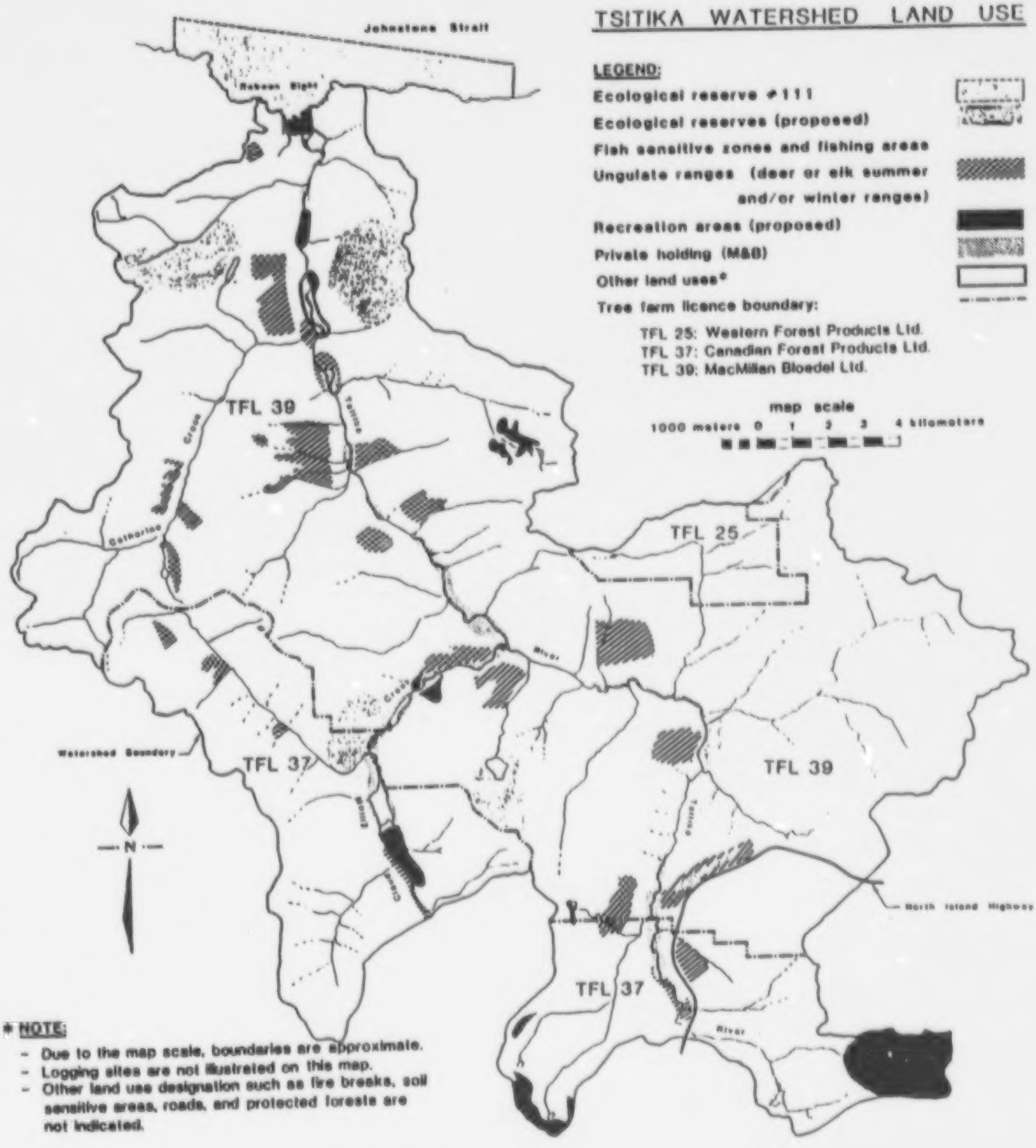
It should be recalled that the guiding objectives worked out within the TPC and based on ELUC terms of reference formed the ground work for all further decisions. To review, the objectives were: to decide on a sustainable timber harvest, while maintaining fish, wildlife, and recreation resources, and minimizing adverse logging impacts. Biophysical analysis did not help to decide on these objectives; it did assist in refining and quantifying them, as well as determining the trade-offs involved. For example, biophysical data were not crucial in formulating the general view that wildlife populations should be maintained. Such data were, however, crucial in determining how to maintain the populations (protect habitat); where and when particular activities should be located (reservation of specific winter ranges for 150 years until other forest areas could replace them); and how much commercial timber and how many jobs would be lost due to the deferrals.

Table 2.2 Tsitika Watershed Folio Maps

Resource Value/ Map Title	Map Contents
Forest Cover	Timber species and inventory data (age/height).
Wildlife	Winter and summer ungulate ranges; travel corridors.
Fisheries	Fisheries sensitive zones; species present. Active erosion zones. Fishery prescriptions (leave strips, timing of timber operations).
Recreation	Visibility zones from Johnstone Strait, North Island Highway. Campsites - primitive; potential for development. Unit boundaries and ratings for various activities.
Terrain	Terrain description (material type and depth, slope), soil characteristics (timber harvesting sensitivity, high sedimentation probability). Engineering considerations (road building, timber harvesting).
Watershed Ecosystems	Biogeoclimatic units separated into silvicultural treatment units; silvicultural prescriptions.
Development Plan	Logging blocks and road construction for 6-year period.
Land Use Plan	Forestry: harvestable, non-harvestable areas. Sensitive soils. Wildlife: long-term logging deferment; short-term (alternate) deferments. Fisheries: Reserves and potential reserves. Recreation: Reserves, proposed park, proposed trails. Proposed ecological reserves: representative ecosystems based on ecosystem map.

Source: Tsitika Planning Committee (1978) Volume 1 (Maps).

Figure 2.8 Tsitika Watershed Land Use Summary Map


TSITIKA WATERSHED LAND USE
LEGEND:
Ecological reserve #111
Ecological reserves (proposed)
Fish sensitive zones and fishing areas
Ungulate ranges (deer or elk summer and/or winter ranges)
Recreation areas (proposed)
Private holding (M&B)
Other land uses*
Tree farm licence boundary:
TFL 25: Western Forest Products Ltd.
TFL 37: Canadian Forest Products Ltd.
TFL 39: MacMillan Bloedel Ltd.
map scale
1000 meters 0 1 2 3 4 kilometers
Johnstone Strait
Robson Bight
TFL 39
TFL 25
TFL 37
TFL 39
TFL 37
Catherine
Creek
Tsitika
River
Creek
Watershed Boundary
N
North Island Highway
River
* NOTE:
- Due to the map scale, boundaries are approximate.
- Logging sites are not illustrated on this map.
- Other land use designation such as fire breaks, soil sensitive areas, roads, and protected forests are not indicated.

(Source: Vreeswijk 1985)

2.6.2 Land use planning in Grande Prairie, Alberta

The second case study illustrates land use planning based on biophysical land unit delineation similar to that proposed by Hills (Hills *et al.* 1970). The purpose of this study was to assist the Alberta provincial government in assessing lease and development proposals by evaluating the capability of different land areas to support various uses (Luff and Ojaama 1979). The planning process consisted of an iterative progression beginning with problem definition and planning team appointment, followed by data collection and analysis, policy formulation, design of alternative land use plans, plan choice, implementation, and review.

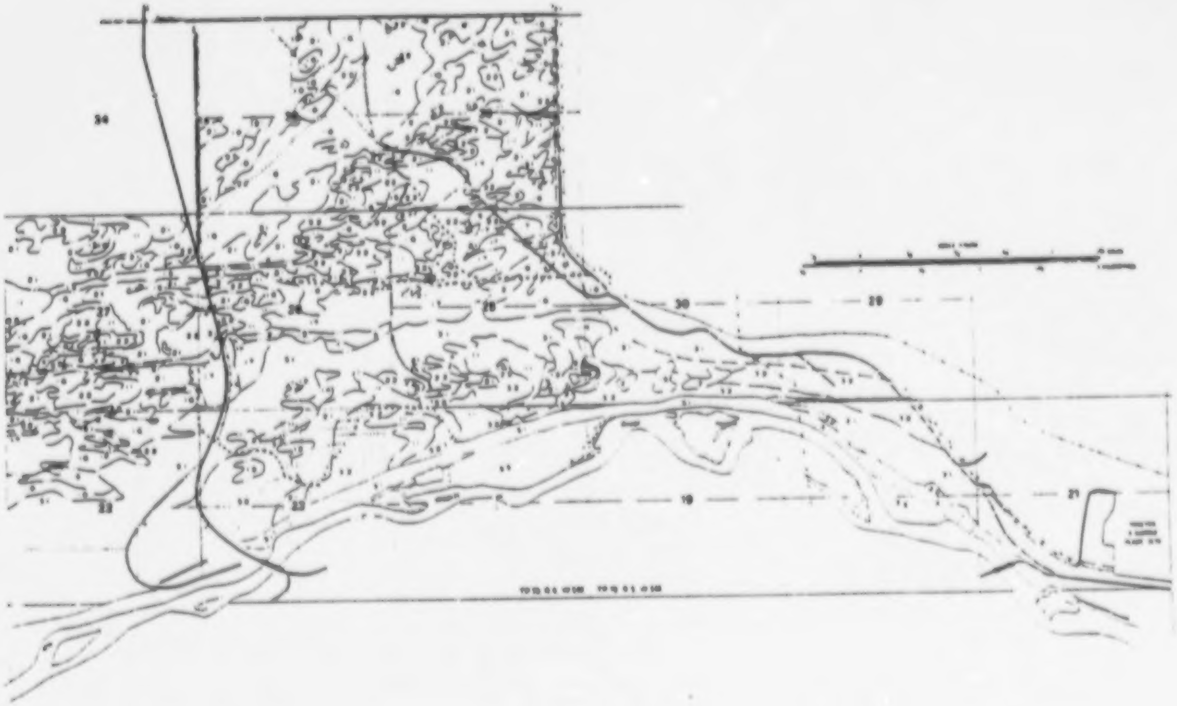
Data collection initially involved identifying relevant information, and appropriate data scale. The scale chosen here was quite large, 1:15,840, reflecting the local nature of the plan, and the fairly small area (18 km^2) under consideration.

The planning team based the biophysical inventory and mapping on the system of Lacate (1969). The study area was divided into 3 land systems based on recurring patterns of slope, landform, soils, and vegetation. These land systems were further divided into 17 land types, each with a specific soil parent material, and homogeneous soil, vegetation, slope, and drainage characteristics (Figure 2.9). Each land type was then rated for the types and severity of limitations it had for different land uses. Table 2.3 shows both the types of limitations felt by the planning team to affect land use capability, and the scheme for rating the severity of limitations.

The iterative nature of biophysical analysis is illustrated at this planning stage. Deciding which land uses to consider was in some ways a function of the policy option chosen. But deciding among alternative policies required some knowledge of which uses were possible in the area. Iterations among data collection, land use evaluation, and policy choice ultimately resulted in a map and table of ratings for each land unit for each relevant land use.

After developing ratings for each land type, the planning team chose a land use objective or policy from among several alternatives. This guiding policy, based on biophysical

Figure 2.9 Ecological classification map for Grande Prairie area.



Land System 1: Aeolian Plain

1.1 Large parabolic dunes
1.2 Small parabolic dunes
1.3 Large dune ridge
1.4 Small dune ridge
1.5 Pseudo-dunes
1.6 Non-dune plain - pine, very flat terrain
1.7 Non-dune plain - poplar and pine
1.8 Non-dune plain - pine, slightly sloping
1.9 Non-dune plain - poplar, very flat terrain
1.10 Non-dune plain - poplar, slightly sloping
1.11 man-made scars

Land System 2: Organic Terrain

2.1 Treed bog
2.2 Sedge fen
2.3 Open water

Land System 3: River Valley

3.1 Valley walls
3.2 Upper terraces
3.3 Point bars

(Source: Luff and Ojaama 1979)

Table 2.3 Land use limitations and rating scheme, Grande Prairie land use planning.

Limitations:

1. Flooding
2. Seasonally high water table
3. Slope
4. Rapid permeability
5. Surface soil texture
6. Groundwater contamination
7. Organic soil
8. Susceptibility to frost heave
9. Thin Ah soil horizon

Degree of Severity

S	Slight to no limitation: free of limitations that affect intended use. limitations are easily overcome.
M	Moderate limitations: limitations that require recognition but can be overcome through planning, design, and management.
V	Severe limitations: limitations make the intended use questionable.

Source: Luff and Ojaama (1979)

data and local needs, was to maximize local recreational opportunities, protect environmentally sensitive terrain, and provide for some needs of local industry, and public utilities. The team decided on seven appropriate prospective land uses: conservation; non-facility recreation; facility recreation; public utilities (water intake and purification); industrial park; sand and gravel extraction (road building and foundations); and private land.

The planning team next grouped land types with similar land use limitations into "ecological planning units." This was done using a matrix of land types and use limitations. For example, the three organic terrain land types all had severe limitations to any use requiring facilities. They were therefore combined into one ecological planning unit. In total, 6 planning units were created (Figure 2.10).

Land use plan formulation began with construction of a land use matrix cross-referencing the ecological planning units with the prospective land uses (Table 2.4). From this matrix and recognition of compatibility among land uses, a land use plan was proposed (Figure 2.11). To complement the map, the plan listed responsible agencies and applicable legislation for implementing various aspects of the plan.

Table 2.4 Ecological land use matrix for Grande Prairie plan[1]

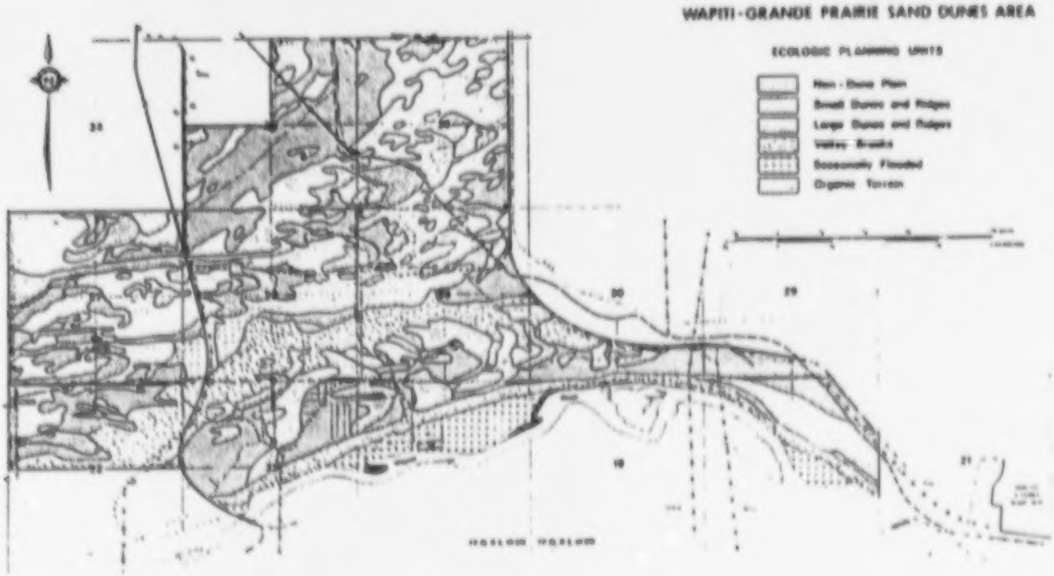
	Recreation 1[2]	Recreation 2	Industrial	Agriculture	Residential	Conservation
Non-dune plain	A[3]	A	A	A	A	C
Small dunes and ridges	A	A	A	A	A	C
Large dunes and ridges	X	A	X	X	X	C
Valley breaks	X	A	X	X	X	C
Organic terrain	X	A/S	X	A/S	X	C
Seasonally flooded	X	A/S	X	A/S	X	C

Source: Luff and Ojaama (1979)

Notes:
1. This is only part of the matrix presented by Luff and Ojaama (1979).
2. Recreation 1 and 2 are facility, and non-facility, respectively.
3. **A** (appropriate) - use may be compatible under some circumstances, with strict controls.
C (compatible) - use is compatible under normal guidelines and regulations.
A/S (appropriate seasonally) - use may be compatible under certain conditions, at certain times.
X (not compatible).

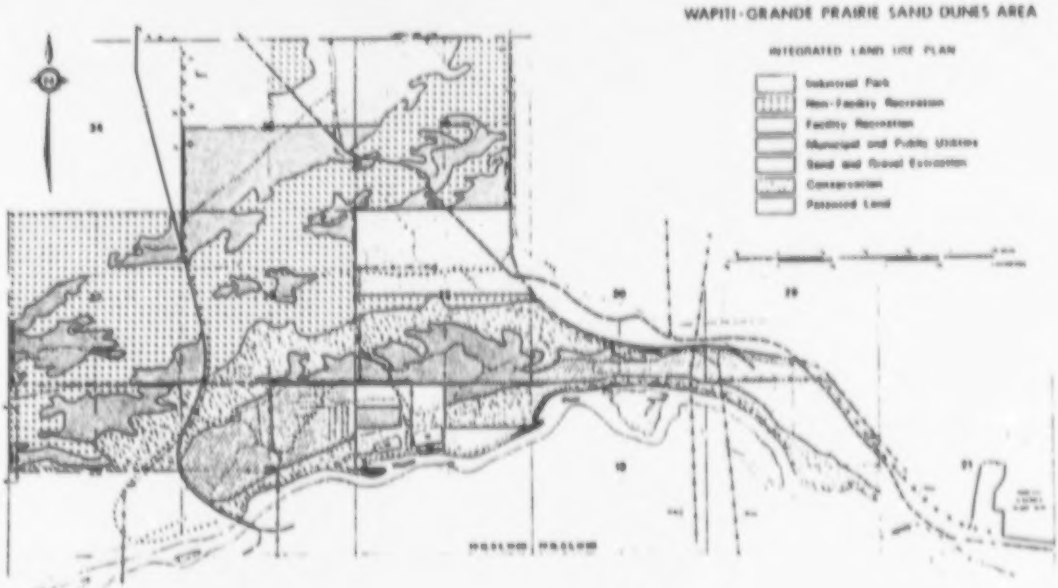
In summary, land planning in Grande Prairie consisted of biophysical inventory and land use evaluation based on fixed land units delineated early in the data collection process. This contrasts to the Tsitika folio plan in which maps of single resource values were overlaid to outline areas of potential conflict needing more study, or special management prescriptions. The Tsitika watershed planning process involved a strategic approach whereby only data relevant to the interests at hand were compiled and analyzed. The Grande Prairie study was more comprehensive, involving an inventory of all resources with the goal of fitting the entire area into a uniform ecological classification. Section 4 of this paper includes an evaluation of the relative advantages and disadvantages of these approaches.

Figure 2.10 Ecological planning units for Grande Prairie, Alberta.


WAPITI-GRANDE PRAIRIE SAND DUNES AREA
ECOLOGIC PLANNING UNITS
Non-Dune Plain
Small Dunes and Ridges
Large Dunes and Ridges
Valley Breaks
Seasonally Flooded
Organic Terrain

(Source: Luff and Ojaama 1979)

Figure 2.11 Land use plan for Grande Prairie, Alberta.


WAPITI-GRANDE PRAIRIE SAND DUNES AREA
INTEGRATED LAND USE PLAN
Industrial Park
Non-Facility Recreation
Facility Recreation
Municipal and Public Utilities
Sand and Gravel Extraction
Conservation
Patented Land

(Source: Luff and Ojaama 1979)

2.7 Summary

To use biophysical information in land use planning and decision making, land must be divided into units having fairly uniform response to management, and an evaluation system and criteria must be developed. Classification of land into homogeneous units can focus either on its biophysical characteristics, or on its capability to support particular land uses.

Biophysical information is used for many different types of planning. Therefore, classifications can be based on different biophysical criteria. Data are also of different scales, and therefore have different uses. Hierarchical classifications, with smaller systems nested in larger systems, are useful for understanding both the ecological context, and the important components at different scales.

The criteria used to delineate biophysical units and to derive evaluations can be more or less explicit. Explicit criteria are useful to ensure compatibility and replicability of data, and to facilitate interpretation by, and communication among different resource specialists and the public.

Evaluation of land use capability requires combination of data. Mathematically and ecologically inappropriate data manipulation is common. Overlay systems are usually not appropriate for summing capability information into single indices. Ecological processes are frequently non-linear, and few processes have been quantified. Weighting of biophysical factors may be used to indicate their differing significance to decisions, but again, limited quantitative knowledge should guard one against simple addition of weighted ratings. To account for complex ecological interactions, evaluative ratings can be constructed according to rules of combination which consider the effects on capability of one or more biophysical components.

Composite land capability maps can be constructed from information on each land use. Such synthesis maps are useful in highlighting areas of multiple capability where possible conflict requires further study and focus of decision making efforts to determine the potential for multiple use, or the need for single use land allocations..

Final land use decisions require development of biophysical goals and quantitative objectives. Biophysical information can assist in showing where and how these goals and objectives can be met, but not which ones to choose.

All stages of biophysical analysis can be facilitated by computerized geographic information systems. GIS increases data manipulation and presentation speed and power over manual computation and mapping. This allows overlaying of data on different resources to construct composite maps, easy updating of inventories, incorporating time, and modelling of interactions among land units. Land modelling is limited by current knowledge of ecological processes. Ability to keep inventories up to date could be increased through use of remote sensing data. Good quality GIS analyses require accurate data preferably of comparable scale, referenced to the same geographic base map.

Section 3. Classifications and Inventories: the Tools of Biophysical Analysis

3.0 Introduction

This section examines how the principles of biophysical classification and evaluation have been put to use in British Columbia. The chapter begins with a discussion of the Canada Land Inventory, the basis for much of the biophysical classification in BC. The rest of the chapter focuses on the development and use of biophysical classifications and inventories by BC government agencies.

3.1 The Canada Land Inventory

The Canada Land Inventory (CLI) was a cooperative effort by the federal and provincial governments designed to assist in regional economic development planning. It began with the Agricultural Rehabilitation and Development Act (ARDA) of 1961. Terms of reference, objectives, and organization were finalized in 1963 (DIAND 1973, Rees 1979).

The objectives of the CLI were: to develop land capability classifications for agriculture, forestry, recreation, and wildlife (ungulates and wildfowl), and for their present use; to estimate the quantity and location of each land class; and to encourage use of CLI data in planning (DREE 1970; Coombs and Thie 1979). A classification of water capability for sport fishing was also developed in some provinces, but unlike other land uses, no maps were produced. The CLI and corresponding provincial land inventory systems were developed to provide reconnaissance level data; that is, for broad land allocation, not detailed management planning. The CLI covered the settled portion of Canada, about 2.5 million square kilometers of Canada's total 9.2 million square kilometers (Canada Envir. 1980).

Inventory data were collected primarily by the provinces with financial and technical assistance from the federal government. Provinces supplied appropriate federal government agencies with data corresponding to map scales of 1:50,000. The federal government published 1:250,000 maps for each land use (1:126,720 in BC for agriculture and forestry). BC maps were of larger scale than for other provinces due to the diversity of BC's terrain. All CLI maps were published by the end of the 1970s (Rees 1979).

CLI ratings reflect the number and type of limitations or opportunities present. Except for recreation, classifications rate the degree to which biophysical factors limit each land use. Recreation classifications are based on opportunities offered by the land. All classifications consist of 7 classes (save for sport fishing which has 4) with class 1 being of the best quality and class 7 having no capability for the use. Capability classes indicate the degree of limitation or opportunity; subclasses may be used to specify the type of limitation or opportunity. Present land use is categorized as urban, agricultural, woodland, wetland, unproductive, and water, and can also be further described with subclasses.

Evaluative criteria were developed nationally so that capability classes would be consistent across all provinces. The criteria - number and degree of limitations or opportunities - were correlated to some measure of productivity for each land use during the field work on which the CLI is based. For agriculture, this measure was the range of crops the land would support; for forestry, the volume of annual tree growth; for wildlife, the animal biomass supportable; and for recreation, the number of recreating people the land could attract and sustain. Therefore, while the CLI class is determined by the degree of limitation or opportunity, it also provides an idea of what the land can produce.

CLI ratings are based on physical criteria only. Market demand and accessibility, and current ownership and use are not considered (DREE 1970). This helps to ensure that information will be useful if socioeconomic factors change (Coombs and Thie 1979). CLI ratings and maps therefore cover only one aspect of land use planning. To assist in comprehensive planning, current land use and other socioeconomic data can be overlaid onto the physically-based ratings using the CLI geographic information system (Rees 1979).

Capability ratings of different land uses are not comparable. Land rated as class 1 for forestry and class 3 for agriculture is not necessarily better allocated to forestry than to agriculture, for example. The ratings must be consulted with reference to the socioeconomic and biophysical context. Allocating satisfactory agricultural land near a farming community to timber extraction according to CLI ratings is hardly an appropriate decision. Similarly, setting aside adequate commercial forest as wildlife habitat when a wildlife sighting has not been documented for years may not constitute a good decision.

The CLI was conceived as a land use planning tool, not as a guide for specific management activities (DREE 1970). It is useful for: zoning, for example, to avoid conversion to uses that are either irreversible or physically incompatible with the land; land acquisition and consolidation for agriculture, recreation, or wildlife habitat; land assessment when those losing land to developments such as dams require compensation; and broad level environmental impact studies prior to location of developments such as transportation corridors, airports, and pulp mills (Coombs and Thie 1979). On a more general level, the CLI offers a basis both for public involvement, and communication among resource management disciplines. It has also stimulated development of resource inventories, and promoted an integrated planning outlook at a time of increasing land use conflict (Coombs and Thie 1979; Rees 1979; Sprout 1978).

Following are brief descriptions of the bases for the CLI agriculture, forestry, recreation, and wildlife classifications. All ratings assume "good" management practices (DREE 1970). More detailed discussion can be found in DREE (1970)

Agriculture

Ratings for agriculture consider climate and soil factors as they affect a soil's ability to support annual crops, and forage or pasture. Subclasses express limitations due to soil depth, drainage, moisture holding ability, nutrient status, salinity, stoniness, terrain, season length, and annual rainfall distribution. Classes 1 through 4 are suitable for field crops. The possible range of crops decreases, and need for soil conservation increases from Class 1 to 4. Classes 5 and 6 are capable of supporting forage crops and grazing. Class 7 is capable of neither crop cultivation nor pasture.

Forestry

Forestry ratings also use soils and climate as bases. Land is rated according to its ability to grow commercial timber. The main criterion employed is mean annual increment, or average growth rate, of the best tree species over a rotation (ie. the period from regeneration to harvest). Soil physical characteristics, depth, moisture, fertility, terrain, and climate are considered.

Recreation

Recreation ratings account for the ability of land to attract and sustain activities. That is, ratings combine presence of recreation features and physical carrying capacity. Lands of classes 1 through 3 can support intensive activities (large numbers of people per area); classes 4 through 6 are capable of dispersed recreation. Subclasses specify the type of opportunity offered by the land; for instance, water access, beaches, visual aesthetics, historic sites, and interesting landforms. The classification covers activities popular at the time the CLI was undertaken; for example, boating, canoeing, sailing, skiing, wildlife and scenic viewing, cottaging, camping, hunting, and rock climbing.

Wildlife

The CLI consists of separate ratings for ungulates and wildfowl, primarily ducks. These types of wildlife were chosen for their public appeal and wide distribution.

Ungulates

Like all wildlife, ungulates require food, cover, and mobility. Ratings consider how climate, topography, and soils affect the ability of land to grow food and cover vegetation, and of animals to move across the landscape. Subclasses specify the nature of capability limitation, broadly divided into climate (rainfall, snow depth, wind) and land (soil and topography).

Wildfowl

Ratings are based on wildfowl's need for food, breeding and nesting sites, and migration stops. Potential to produce and support wildfowl depends on landform and topography, water availability and quality, plant cover, and climate. Highest capability occurs in areas with fertile soil with good water retention, and topography suitable for wetland or marsh formation. Examples of limitations are high possibility of drought, widely fluctuating water level, excessively shallow or deep water, excessive soil permeability, soil or water acidity and salinity, and steep-sided lakes precluding marsh development.

3.2 Canada Committee on Ecological (Biophysical) Land Classification

Limited availability of biophysical information precluded capability classification in much of Canada during compilation of the CLI (Rees 1979, Wiken and Ironside 1977). This situation required development of a system to "... classify and map ecologically significant units of land, as manifested by their inherent biological and physical characteristics" rapidly and with minimum expense (Wiken and Ironside 1977). The Subcommittee on Biophysical Land Classification of the National Committee on Forest Land (NCFL) developed a system which combines climate (inferred from vegetation), landforms, and soil (Lacate 1969). The system incorporates work from Australia (Christian 1958; Christian and Stewart 1968), England, Russia, and Canada; its Canadian antecedent is the work of Hills (Hills *et al.* 1970). In 1976, the Canada Committee on Ecological (Biophysical) Land Classification (CCELC) was formed to carry on the work of the NCFL (Wiken and Ironside 1977). The purpose of the CCELC is to promote use of a uniform ecological classification for land use and management planning and environmental impact assessment (Wiken and Ironside 1977). By the time of the formation of the CCELC, it was also recognized that a relatively value-free biophysical mapping system was needed to enable land use capability analysis as social demands and preferences shift (Rees 1979).

Table 3.1 shows part of the hierarchical integrated classification proposed by the CCELC. This table combines the biophysical feature-oriented descriptions of Wiken and Ironside (1977) and Wiken (1986), with the process-orientation of Rowe (1979). The CCELC hierarchy includes both broader and finer categories than shown here (Wiken 1986). Each level is useful for different purposes; the units shown in Table 3.1 are of scales commonly used in land planning.

Not all Canadian provinces, including BC, have adopted the CCELC categorization. However, the system provides a guide for developing ecological classifications for specific provincial contexts, and has found use in BC both as a conceptual backdrop for biophysical classification in the Ministry of Environment (section 3.4.1), and in development of an hierarchical wildlife habitat classification (section 3.4.1.3). Further, the CCELC objective of promoting use of uniform classification for resource planning and impact assessment is worth remembering. The difficulties of integrated resource planning can only be intensified if each resource interest uses a different inventory method and classification. Perhaps a single classification for all of Canada would be unrealistic given the ecological and administrative variability. However, it may not be so unrealistic within a province. But, balanced against the advantages of a uniform classification system are the diverse objectives and needs of different resource agencies and users. Subsection 3.4 examines the biophysical classifications used by some BC resource agencies. This will assist in determining where and how cooperation among agencies in the development and use of biophysical classification may streamline resource planning.

3.3 The British Columbia Land Inventory

Within the CLI agreement, each province was to form an inventory committee. In BC, this committee operated first within the Department of Agriculture, then the Resource Analysis Unit of the Environment and Land Use Committee (ELUC), and finally the Ministry of Environment Resource Analysis Branch which later became the Assessment and Planning

Table 3.1 Ecological categorization proposed by the Canada Committee on Ecological Land Classification

Level of generalization and commonly used scales	Definition and features for recognition
Ecoregion 1:3,000,000 to 1:1,000,000	Area of distinct regional climate as expressed in development of vegetation, fauna, and soils. Bounded by large-order physiographic patterns (eg. mountain range, valley system, plateau).
Ecodistrict 1:500,000 to 1:125,000	Areas where patterns of relief, geology, and geomorphology modify regional climate to produce distinct biophysical (landform, flora, fauna, drainage) patterns. Boundaries set by large-scale changes in relief pattern or bedrock.
Ecosection 1:250,000 to 1:50,000	More homogeneous areas within ecodistricts of recurring patterns of landform, soils, flora, fauna, and water systems. Recognizable by expression of surface geology (eg. hummocky till landscape; glacial outwash plain).
Ecosite 1:50,000 to 1:10,000	Small area with uniform biophysical characteristics, delimited by changes in slope and soil materials or depth.

Sources: Rowe (1979); Wiken and Ironside (1977); Wiken (1986)

Division (Rees 1979). Later sections of this paper discuss specific biophysical classifications developed by BC government agencies. This section covers the philosophy behind, and some uses of, the BCLI.

The CLI efforts in BC resulted in both land use capability maps, and biophysical inventories. The biophysical mapping approach in BC consisted of separate inventories and maps of biophysical factors (Walmsley 1976). These maps - of physiography, vegetation, geology, soil, and aquatic systems - could be overlaid to delineate areas of similar biophysical composition, or point to coincidences between proposed human activities (eg. logging) and natural features (eg. wildlife habitat). The overlay approach helped to retain all information for use as needed in specific resource planning exercises. The capability maps and inventory data were used for zoning, land acquisition, assessment, environmental impact assessment, and interdisciplinary planning as discussed in subsection 3.1 of this report. Examples from BC include a prime use map, the Agricultural Land Reserve, and folio planning by the Ministry of Forests.

3.3.1 Prime Use Maps

The Land Capability Analysis Committee of BC, a cooperative effort of federal and provincial resource agencies, produced prime, or best, use maps (Rees 1979). CLI maps of the top three capability classes for each sector (agriculture, forestry, recreation, wildlife, and special uses, like native range) were overlaid to delineate prime use areas (Coombs and Thie 1979). Lower quality lands were included where capability for all uses was not high (Rees 1979). On lands where capability for more than one use was high, the Land Use Analysis Committee used biophysical data to assist in reaching consensus on which activity should receive priority. Compatible uses were listed in background information to the best use maps (Rees 1979). Few details are available about specific criteria used for these land use evaluations and trade-offs. The maps were to show prime uses from an ecological perspective only (Rees 1979; Coombs and Thie 1979); socioeconomic linkages (markets and access), potential effects of adjacent land uses on each other, and the rationality of the resulting land use patterns most likely played less important roles than biophysical criteria. Prime use maps were used for a while in the early 1970s to guide land allocation (Sprout 1978).

3.3.2 The Agricultural Land Reserve

The prime use maps and other CLI data found one of their more widely known uses in the creation of BC's Agricultural Land Reserves (Rees 1979). A small proportion of BC is capable of supporting cultivation; less than 1% is class 1 agricultural land. Long term food self-sufficiency became an issue in BC, and all of Canada, in the late 1960s. Concerns about loss of prime agricultural land to non-compatible, sometimes irreversible, uses - directly due to urban, industrial, commercial, or resource development, or indirectly due to fragmentation - led to a freeze on sub-division or non-farm use of agricultural lands in late 1972 (Canada Envir. 1978). The freeze was brought into legislation with the Land Commission Act of 1973.

The purposes of the Land Commission Act were:

1) to preserve agricultural land for possible future use;

2) to maintain viable farming communities (Canada Envir. 1978).

(Later amendments deleted other initially stated purposes of the Act: preservation of parkland for recreation; formation of land banks for urban and industrial development and greenbelts around urban areas. These tasks were felt to be accomplished by other government agencies (Canada Envir. 1978).)

The designation process for Agricultural Land Reserves (ALRs) consisted of initial Department of Agriculture proposals based on CLI capability data, and forecasts of short term urban expansion (Canada Envir. 1978; Rees 1979). Regional districts reviewed the proposals, held public meetings to discuss them, and then submitted suggested revisions. Final ALR boundaries were subject to cabinet approval. ALR designation involved four criteria:

1) inclusion of CLI class 1 to 4 agricultural land not irreversibly developed in non-conforming uses, and greater than 0.8 hectares (2 acres) in area;

2) exclusion of enough land for about 5 years of urban expansion if other non-agricultural land was not available;

3) inclusion of CLI class 5 and 6 agricultural land where ranching was important, or if it could used in conjunction with class 1-4 lands; and

4) inclusion of non-agricultural land (class 7) where this would preclude incompatible uses with potential negative effects on surrounding agricultural land (Canada Envir. 1978).

All Regional Districts had finalized ALRs by 1975. An appeal process allows for both exclusions from and inclusions to the ALR. The total ALR area in BC has fluctuated around 4.7 million hectares; the smallest area, in 1982, was 4,682,008 hectares, the largest, in 1975, was 4,723,566 hectares (BC Prov. Agr. Land Comm. 1989).

The ALR has had mixed success in meeting its objectives. It has protected high quality agricultural land from being converted to non-farm uses. About 80% of CLI class 1 to 4 agricultural lands in BC lay within the ALR. However, the restrictive zoning has assured neither maintenance of viable farm communities, nor actual use of land for farming (Canada Envir. 1978). High quality land is necessary to maintain viable farms, but it is not sufficient. Besides physical soil capability, farm viability is a function of economic factors such as input costs, produce prices, and tax regimes. A further factor is total farm area, as this affects technologies of scale (Canada Envir. 1978).

Biophysical factors are a necessary component of land use planning. Clearly, however, planning done without recognition of the socioeconomic context cannot meet social objectives successfully.

3.3.3 Folio and Integrated Resource Planning

Inventory data compiled for the BCLI constituted the bulk of biophysical information used in "folio" planning beginning in the 1970s (Rees 1979). Folio planning, particularly important in timber allocation, consisted of overlaying maps of forest inventory, recreation, fish and wildlife, water, and other relevant resources. This system facilitated interdepartmental planning by providing a means for communication of resource interactions and potential conflict (Rees 1979). Folios were used for watershed-level planning where potential for conflict among resource users was high. Its prime use was to highlight areas where conflicting resource values coincided, and therefore to indicate where allocation or management decisions were needed. Biophysical folio maps could assist in allocating land among incompatible uses either where existence of alternate areas allowed compromises (for example, logging could be allowed in one important wildlife area if sufficient habitat existed elsewhere), or where very high importance could be attributed to an area for one use (for example, logging might not be permitted in critical deer winter range, or close to fish spawning grounds). Where differences between resource values were more equivocal, the purely biophysical folio maps were less useful on their own (O'Riordan 1976). In the late 1970s, folio planning became Local Resource Use Planning (LRUP), which incorporated more involvement of local resource users, as well as resource agencies. LRUP retains the premise of folio planning: integrating biophysical knowledge of several resources to highlight valuable areas and potential conflicts. The Tsitika watershed case study discussed in section 2.6 is an example of folio, or local resource use, planning.

3.4 Biophysical Classification and Inventories in BC

Several government agencies in BC are concerned with biophysical resource management. Some, particularly the Ministries of Environment (MoE), Forests (MoF), and Energy, Mines, and Petroleum Resources (MoEMPR) actively develop and maintain resource classifications and inventory systems. Others, the Ministries of Tourism (MoT), Parks (MoP), and Crown Lands (MoCL) base their resource analyses, and in the case of MoP, their own classification system, on the work of MoE and MoF. The MoCL recently received the mandate to develop inventory guidelines, procedures, and policies to help ensure consistent data collection, storage, and display among agencies (BC MoCL 1989). This Corporate Land Inventory Strategic Plan (CLISP) should facilitate inter-agency planning by ensuring that all relevant data can be used within a common GIS. The MoF is now developing such a system, the Analysis Framework for Integrated Resource Management (AFIRM) (BC MoF 1989a). As discussed in section 2.5, accurate results from GIS analysis require use of data collected at comparable scales within a consistent mapping or coordinate system. This does not require data collection within identical units, but does require that unit boundaries are accurate within a coordinate system (Bailey 1988). CLISP should assist in coordinating agency inventory activities so that GIS based analyses are accurate, as well as provide increased ability to share information among agencies.

While CLISP is well developed on paper, it has yet to be implemented. Full implementation will require commitment and considerable expense in collecting, analyzing, and entering data, and purchasing and maintaining computer software and hardware. In a recent survey of BC government agencies and Crown corporations during preparation of the CLISP framework, 65% of respondents claimed that available data were inadequate for land planning needs (BC MoCL 1989: 24). Further, 80% of the respondents indicated that digital (ie. computerized) rather than manual (ie. maps, charts and reports) data were needed. However, currently only 20% of the requirements for digital data are being met (BC MoCL 1989: 27).

Clearly, data need to be both gathered and compiled in a format useful for contemporary planning. Data collection constitutes only perhaps one-quarter of the total expense in getting appropriate information to users (Chamberlin 1990 pers. comm). Since funds are always limited, it is important they are used wisely. Therefore, it is clear that the corporate information system must be developed to ensure that collected data are translated into useful forms and entered into the computer network.

Another inter-agency effort with general applicability to resource classification and inventory is a guidelines manual for collecting ecological field data (Walmsley *et al.* 1980). These guidelines were developed jointly by the MoE and MoF, and have recently been updated (Luttmerding *et al.* 1990). They provide a standard framework for data collection thereby facilitating development of compatible ecological classifications, and sharing of data thereby minimizing field work duplication.

Inter-agency cooperation in data collection and ecological classification is a relatively recent phenomenon, covering perhaps the last 10 or 15 years. The corporate data strategy is a very recent initiative. In the past, different agencies have developed inventory and classification systems based on their own needs with limited attention to their compatibility within an integrated planning framework. The following subsections discuss these various classifications, and where information is available, the current status of, and data gaps in, resource inventories. The discussion is structured for the most part according to the agency responsible for collecting and classifying information on each resource value. The MoE is responsible for soil, wildlife, fish, and water inventories. The MoF collects timber, range, and recreation data. The MoP is developing a classification to assist in ecosystem conservation planning. The MoT, MoCL, and federal Department of Fisheries and Oceans (DFO) to a large extent undertake resource planning in cooperation with the MoE and MoF. Their activities will be discussed in the appropriate subsections.

3.4.1 Biophysical classification in the Ministry of Environment

The BC MoE inherited the roles of biophysical classification and land evaluation from the ELUC Secretariat in the mid-1970s (Rees 1979). In general, the MoE documents and analyses biophysical resources in an area when other government agencies require information for large resource developments (eg. Vold 1977, 1978), resource use conflicts (eg. BC MoE 1982), or regional planning (eg. Ryder 1981; Lea 1984). Biophysical information from mapping exercises is used to rate areas for agriculture, forestry, wildlife, recreation, visual absorption capacity, and engineering (Vold 1978). Mapping is generally done at two scales: a broad one (1;250,000) to assist in regional planning; and a finer one (1:50,000) for local and watershed use and management planning. Larger scale (ie. 1:50,000) maps are useful for highlighting potential problems (eg. unstable slopes) or opportunities (eg. gravel sources) which require ground checking (Vold 1977; MoE 1982).

MoE biophysical mapping is rooted in the climate- and landform-based approach of the CCELC. Various branches within the MoE have developed classification and evaluation systems for specific biophysical factors (soils, terrain, vegetation, aquatic systems) and uses (recreation, wildlife).

To assist in resource planning, the MoE developed CAPAMP (Computer Assisted

Planning, Assessment, and Map Production) beginning in 1980 (Kenk *et al.* 1987; Sondheim 1990 pers. comm.). CAPAMP was, during its time, a sophisticated GIS used for producing project specific resource analyses. The system consisted of soils, agricultural capability, surficial geology, forest cover, and other biophysical data, and algorithms (mathematical formulae) used to develop interpretations. About 50 analyses and interpretations were done on themes such as: post-logging landslide hazards; tree species selection for regeneration; evaluation of ungulate habitat; irrigation requirements for agriculture; potential for chemical contamination of lake water from farms and settlements; and effects of economic factors (interest rates, land improvement costs) on farm viability (Kenk *et al.* 1987).

In about 1987, progress in computer technology surpassed that employed in CAPAMP (Sondheim 1990 pers. comm). Since then the expert-oriented CAPAMP has largely been abandoned in anticipation of a GIS format in which many users can access data, as is one objective of CLISP. However, data from CAPAMP have yet to be reloaded into another computer network (Louie 1990 pers. comm). These data will hopefully be transferred to a database accessible to the computer network developed for CLISP.

3.4.1.1 Soil and Agricultural Capability

Soil inventories combine physiography, surficial materials, vegetation, and soil development (Vold 1977, 1978). The System of Soil Classification for Canada (Canada, Agric. 1978) forms the basis of soil descriptions. In 1988, eighty-nine soils maps existed or were in preparation for BC (Canada, Agric. 1988). These range in scale from 1:5,400 to 1:1 million, with most in the 1:16,896 to 1:100,000 range. The soil inventory covers most of the inhabited areas of BC: Vancouver and the Lower Mainland, south and middle interior, and Vancouver Island. The Coast Mountains and northern interior are not inventoried.

Until recently, BCSIS (the BC Soil Information System) a computerized data bank developed cooperatively by the MoF, MoE, BC Ministry of Agriculture and Fish, and the federal Department of Agriculture provided a standardized framework for collection, storage, and retrieval for soils data (Sondheim and Suttie 1983). BCSIS was never widely used, and was abandoned in early 1990 (Louie 1990 pers. comm). However, CanSIS (the Canadian Soil Information System) houses some digital soil information, as did CAPAMP (see subsection 3.4) (Canada. Agric. 1988). The remainder is available in map form.

The CLI approach forms the basis of MoE interpretations of agricultural capability (Vold 1977; BC Climatology Unit 1981). That is, the larger the range of crops the soil will support the higher the rating. Most land with high biophysical capability for agriculture is zoned within the ALR (see subsection 3.3.2). Therefore, relatively little effort would be required in regional planning exercises to delineate potential agricultural areas.

3.4.1.2 Vegetation

The MoE vegetation classification is very similar to the biogeoclimatic system developed by the Ministry of Forests (see section 3.4.2.2). The two systems initially developed along slightly different paths. But as the MoF classified more of the province with the biogeoclimatic system, the MoE began using biogeoclimatic zonation as a basis for its further delineation of vegetation landscapes (Lea 1986). The MoE approach emphasizes topography somewhat more than the biogeoclimatic system. This difference reflects the MoE role in land use interpretation as compared to the MoF's need for specific management prescriptions.

3.4.1.3 Wildlife

Wildlife classification has developed substantially since the CLI. Ungulate and wildfowl classifications within the CLI were based on the requirements of only some animals, particularly black-tailed deer (Demarchi *et al.* 1983), and wildfowl, mostly ducks (Environment Canada 1981). However, not all wildlife species are adapted to the same habitat. In response, a biophysical approach to classification for ungulates was developed for BC (Demarchi 1982; Demarchi *et al.* 1983).

The MoE also sponsored development of a wetland classification useful for wildlife planning (Beets 1982; Runka and Lewis 1981). Steen and Roberts (1988) used this system when developing the MoF guide to wetland ecosystems in part of the Cariboo plateau. While wetland classification is a subject on its own, wetland areas could be classified and evaluated with the ungulate habitat system. Further, the ungulate classification has been incorporated into a hierarchical classification (Demarchi *et al.* 1990), and could be expanded to other wildlife species. Therefore, the ungulate classification is discussed here.

Biophysical ungulate classification entails delineation of biophysical units from terrain, vegetation, and climate so that areas can be evaluated for different species according to inherent potential of the land. Demarchi (1990a) and Demarchi and Lea (1989a) describe the hierarchical classification under development in the MoE Wildlife branch. This system combines biophysical concepts reminiscent of the CCELC, and the biogeoclimatic system used by the MoF. (The biogeoclimatic system is described in sub-section 3.4.2.2) Table 3.2 shows the hierarchy, and the planning uses of various levels.

Spatial and temporal considerations are important in wildlife habitat classification. To fill various behavioral (eg. escape routes, calving areas) and seasonal requirements (eg. winter habitat, migratory routes or stop-overs), wildlife need different types of habitat. Therefore, wildlife management requires knowledge of the spatial and temporal dynamics, and quantity of particular habitat types. This differs from timber management, for example, where the prime considerations are choosing the most appropriate harvesting technique, tree species, or site preparation method. Timber managers use the biogeoclimatic system, which provides an indication of potential growth and probable successional trend, as a guide to such decisions. Wildlife managers can also predict the vegetational dynamics of habitat over time within a land unit using the biogeoclimatic system. By integrating this knowledge of each land unit into broader biophysical areas, they can predict spatial patterns. However, the biogeoclimatic system itself does not facilitate classification of land according to the needs of wildlife.

Table 3.2 Biophysical wildlife habitat classification in British Columbia

Classification Level	Mapping Scale, Planning Level	Distinguishing Features, Main Uses
Ecoregion	1:2,000,000 Provincial	Broad scale climate, physiography (general landform pattern), and plant and animal distribution. Useful for examining current and potential animal distribution over broad areas.
Ecosection	1:500,000 Regional	Sub-division of ecoregions based on climate, terrain, soil, vegetation, and animal use. Useful in examining regional wildlife distribution and needs.
Biogeoclimatic Units	1:250,000 Regional, Timber Supply Area, Operational	Based on climatic zonation, and climatic climax vegetation. Terrain divided into groups of local landforms. Useful for determining biological productivity for capability rating; forecasting successional change in vegetation to predict habitat suitability changes over time.
Biophysical Habitat Classes	1:50,000 TSA and Development Planning, Operational	Local landforms, and topography (slope classes, aspect); soil classes (texture, depth, chemistry); plant communities (successional and climax). Defining units of potential and current wildlife use.
	1:20,000 Watershed Planning	Specific landforms and more specific soil classes than at 1:50,000; current successional stage. Predicting effects of human activity on wildlife.
	1:5,000 Special Projects	Micro-climate, specific soil, parent materials and plant community. Defining specific sites of animal use.

Source: Demarchi, Clark, and Lea (1990)

Broader forest-level concerns are not as important for timber as for mobile wildlife (Demarchi 1990, pers comm).

The MoE classifies land according to its inherent biophysical capability for wildlife (Demarchi *et al.* 1983). Similar to the CLI, then, this classification does not account for the current administrative, economic, or biophysical state of the land. Clearly though, other socioeconomic factors would require consideration before allocating a land unit to wildlife habitat.

Biophysical wildlife capability classifications facilitate both management (eg. choosing areas for habitat enhancement or protection) and land allocation (eg. protecting habitat from development) (Demarchi *et al.* 1983). Different scales of classification can assist in these tasks. Smaller scale maps (1:125,000 - 1:250,000) are useful in determining general spatial distribution and links among habitat units, and to establish the regional needs for wildlife habitat. An example is the wildlife maps for the East Kootenays (MoE 1989). Larger scale maps (1:20,000 - 1:50,000) can help to delineate areas having specific biophysical characteristics, thereby facilitating formulation of local management plans (Demarchi and Lea 1989b). If wildlife management requirements are not compatible with other resource management activities, a land allocation decision must be made. For example, if the habitat unit under consideration was not critical when viewed in the regional context, another use could take precedence in that area. Therefore, different levels of hierarchical classifications can be linked to assist in making both management and allocation decisions.

To provide adequate information for current needs, the MoE Wildlife Branch estimates it would have to spend approximately $18 million over 5 years on the wildlife habitat inventory (Demarchi 1990b pers. comm). This expenditure could assist in completing 1:250,000 maps for strategic level, Timber Supply Area planning, and 1:50,000 maps for critical areas requiring more detailed planning. Some 1:20,000 mapping could possibly be done in some areas of particularly intensive use. To complement habitat inventories, the MoE performs research including cooperative work with the MoF in the Integrated Wildlife Intensive Forestry Research program (eg. Eng and McNay 1989).

3.4.1.4 Fisheries and Aquatic Systems

The BC MoE cooperates with the DFO in planning for and managing fisheries habitat. DFO and MoE, within the Federal/ Provincial Fish Habitat Inventory and Information Program, have developed a Stream Information Summary System (SISS). The SISS is based on the aquatic system inventory developed by the MoE (Chamberlin 1979). The computerized SISS database includes information on fish (escapements, life history timing), fish habitat (stream location, gradient, obstructions, flow), current management activities, and fish production potential and constraints (Canada DFO 1989). Stream Summary Catalogues present summary data from the SISS. The catalogues, published by DFO administrative units, are currently available for 18 of 45 DFO subdistricts in BC (Canada DFO 1990).

The SISS considers salmonid species only, therefore covering only some of the fish species in BC. From an economic perspective the SISS may include the appropriate species. But if biological diversity concerns shift some attention to less economically critical species as has been the case in wildlife management, the inventory may need to expand.

Geographically, stream information is sparse for areas north of Williams Lake (Lewis 1990, pers comm). The SISS contains information on about 3000 streams (Canada DFO 1989), but the BC MoE claims that 200 of the 4000 rivers and streams in BC are inventoried at reconnaissance levels (1:50,000) (BC MoE 1990). This information is useful for highlighting stream reaches which may have critical or sensitive habitat, and delineating location and timing of fish presence, which can help when development proposals are referred to the MoE. However, 1:50,000 maps are too broad to enable specific management recommendations (Carlson 1990, pers comm). More detailed information (ie. 1:20,000) needed for the referral process is limited. Fisheries branch personnel currently use topographic maps, historical records, and experience when responding to referrals. Topographic maps give a general indication of the probable importance of a stream to fish, and form a basis of stream reach categorization in the Coastal Fisheries/Forestry Guidelines (MoFL/MoE 1987).

The MoE plans to invest about $3 million between 1991 and 1992 to perform reconnaissance inventories ($900,000) and research on fisheries management ($2.1 million). These efforts will not complete the inventory, but the data collected will allow extrapolation to other streams (Lewis 1990, pers comm). Research priorities include: developing regional management targets; investigating fish population dynamics; assessing non-consumptive uses of fish; and determining the long-term effects of environmental change on aquatic resources, which includes use of fish as indicators of water quality (Lewis 1990, pers comm). Continued research into the ecology of aquatic systems is needed to improve management capabilities, and also to highlight which ecosystem data should be inventoried.

A stream inventory would assist in setting priorities for field checks, and in general zoning for different types of management, for example , timber harvesting methods. Maps would never replace the need for field personnel, but could promote efficient use of time.

3.4.1.5 Terrain Classification

Terrain, the combination of topography, bedrock, and geomorphology, affects activities from agriculture and timber harvesting, to location and construction of roads, pipelines, buildings, and other settlement infrastructure. The MoE uses a terrain classification system (ELUCS 1976; Howes and Kenk 1988) to facilitate mapping and interpretation of geologic hazards and opportunities for land use and management. The MoE and MoF have cooperated in writing a manual to assist in identifying potentially unstable slopes for timber management prescriptions (Howes 1987). Managers can use these interpretations to locate or design harvesting to minimize sediment transfer into fish bearing streams, or loss of soil for future timber growth. Forest companies are required to map proposed harvesting areas using the MoE terrain classification (Howes 1990, pers. comm).

Terrain associated hazards and opportunities are a major determinant in choosing sites for sub-division and new settlements (Maynard 1979). Load bearing capacity, drainage characteristics, and slope stability affect capability for structural foundations, excavations (eg. utility corridors), liquid and solid waste disposal, roads, and above-ground water storage (Ryder and Howes 1984). Areas susceptible to geologic hazards such as landslides, rockfalls, debris flows, and avalanches, should be avoided during development to minimize chances of life and property loss (Ryder 1981). The siting of Tumbler Ridge, part of the Northeast coal project, relied heavily on terrain information, as well as potential conflicts with fish and wildlife habitat, and heritage resources, and recreation potential (Quin 1979).

Currently, the bulk of terrain mapping in BC is contracted out by the MoE (Howes 1990, pers. comm). The MoF and corporate Tree Farm License holders also do some mapping, as does the MoE Wildlife Branch in its habitat capability work. Because of this task division, it is difficult to know exactly how much of the province has been mapped. There is no central data bank for terrain information in BC. Further, due to limited MoE staff and financial resources, monitoring of mapping and related interpretations is difficult, particularly in the case of outside contracts.

A rough estimation is that approximately one-third of BC's terrain has been mapped at 1:50,000 (Howes 1990, pers. comm). Larger scale (1:20,000) mapping is normally done prior to development; less of the province is mapped at this scale than at 1:50,000. Smaller scale maps are usually sufficient for long-term strategic planning, that is for example, allocating land to different uses when determining allowable annual cuts for Timber Supply Areas (Schwab 1990, pers. comm). However, for more site specific decision making, for example, locating cutblocks during timber harvest development planning, 1:20,000 data are needed. It is a MoE objective to map all operable timber harvesting areas in coastal BC at this larger scale (Schwab 1990, pers. comm).

A useful terrain inventory should include interpretations of terrain maps - sensitive or unstable terrain, areas prone to avalanche - since most users do not like to interpret raw terrain maps (Schwab 1990, pers comm). An estimated cost has not been determined for completing larger scale mapping for operational planning, the smaller scale strategic level mapping, or map interpretations. A central repository for all agency- and company-collected terrain information is necessary for making such an estimation. As mentioned earlier, such a data bank does not exist. Besides helping to determine how much information exists, such a database would also minimize duplication of effort among agencies and industries requiring terrain data.

3.4.1.6 Water Resources

The MoE Water Management and Waste Management Branches are responsible for managing water supply and quality on Crown lands. The Waste Management Branch grants legally binding permits or approvals for activities that might affect water quality. Provincial *water quality criteria* (WQC) form general guidelines to protect water for all uses, while *water quality objectives* (WQO) are specific to a watershed or water body, and guide planning and development, including permit formulation.

WQCs cover chemicals (chlorine, mercury, lead, etc.) and other environmental quality variables, such as acidity (pH), colour, particulate matter, and nutrients and algae (Buchanan 1987). The provincial WQCs guide the setting of specific WQOs depending on the types of uses prevalent in the watershed or body under consideration. In some areas the objective is to maintain current high quality, whereas in others, it is to ensure water quality does not sink below a minimum standard.

As of July 1990, WQCs were completed for 12 substances, with reports forthcoming on 8. WQOs were set for 26 areas, with 21 reports in progress (BC MoE 1990). Quality objective-setting has been concentrated in areas close to industrial developments, such as pulp mills. Of the areas with WQOs, only one is a community watershed: Hydraulic Creek near Kelowna (Buchanan 1990, pers. comm). As WQO-setting is completed for current priority areas, emphasis will likely shift to community watersheds.

The MoE and other government agencies cooperated in developing Guidelines for Watershed Management on Crown Lands used as Community Water Supplies (BC MoE 1980).

These provide general guidance during planning for timber harvesting or other developments. However, they do not offer specific management or land allocation prescriptions as would WQOs. The Guidelines become operational when the MoCL notifies the MoE Water Management Branch that an area under application for development is a community watershed (Reksten 1990). The Water Management Branch is therefore involved in integrated resource management planning for community watersheds. As resource development and integrated planning increase in scope in BC, the Water Management Branch role will expand. The setting of WQOs for individual watersheds to provide more specific direction to development planning will be an important aspect of this involvement (Buchanan 1990, pers comm).

The setting of WQOs can play a role in developing more comprehensive Integrated Watershed Management Plans (IWMP). The MoE and MoF have undertaken IWM planning in some areas of BC, mostly in response to community water supply/ logging controversies (Reksten 1990). As of March 1990, 5 IWMPs were finished or near completion, and 5 planning processes were underway (Reksten 1990). Pressures for development of community watersheds are increasing. Integrated planning could form a rational basis for watershed developments, such as logging and mining. However, staffing and budget constraints in the MoE frequently necessitate delegating planning coordination to other agencies, particularly the MoF, or dealing with development proposals through referrals (Reksten 1990).

3.4.2 Biophysical Classification in the BC Ministry of Forests

The BC Ministry of Forests has a legislated mandate to plan for integrated management of timber, fish, wildlife, recreation, and water in consultation with other government agencies (BC 1979a,b). The MoF is responsible for managing timber, range, outdoor recreation, and wilderness on the Provincial Forests. The MoF normally refers issues relevant to other non-timber resources to other agencies for comment. For example, during so-called development planning, the MoF requires forest company licensees to send proposed timber harvest plans to the Fish and Wildlife Branch of the BC MoE. The MoE then may recommend alterations to cutting boundaries, or management actions to account for sensitive habitat.

3.4.2.1 Timber

The MoF timber inventory contains information on forest stand volume, age, height, stocking (per cent coverage of a site by trees), and site quality, as well as environmental sensitivity of non-timber values to timber harvesting. Volume, age, height, and stocking data are collected in the field periodically, and then updated annually according to forest growth models, timber harvest records, and information on losses to fire, insects, and disease. Environmentally sensitive area (ESA) codes are used to highlight land units with either significant non-timber values, or high sensitivity to timber harvesting (eg. fragile soils).

The MoF timber inventory site quality estimates are based on the standing crop; if the existing forest comprises large trees which appear to have grown quickly, the site is rated as high quality. Unlike the CLI forestry classification, current MoF site quality ratings are not based on observations of site components (soil, moisture), and estimates of their capability to grow timber. Use of the standing crop as the sole indicator of site productivity can result in incorrect estimation of timber growth potential (Louie 1990 pers. comm).

The biogeoclimatic ecosystem classification discussed in the next section forms the basis of some work on estimating inherent biological productivity of sites (MacKinnon *et al.* 1988). However, the CLI ratings still provide the only classification of timber growth potential based on soil and climatic factors.

Vold (1977) expands CLI forestry interpretations to include limitations due to regeneration problems, windthrow hazard, logging road construction, and erosion hazards. These considerations affect land suitability more than inherent capability, as they all to some extent depend on the specific management techniques used. Biophysical analysis requires information on inherent capability. Such data should not be lost if they are combined with other information to produce suitability ratings. Computerized GIS data processing capabilities should facilitate both updating of old biophysical capability ratings, and combining capability and suitability factors into more comprehensive evaluations.

3.4.2.2 Biogeoclimatic Classification

The ecological classification most used by the MoF is the biogeoclimatic system (Pojar *et al.* 1987). The biogeoclimatic system is an integrated hierarchical classification incorporating climate, vegetation, and soil (including terrain and parent material). The basis of the system is climate as reflected in potential climax vegetation. On the other hand, the biophysical system used by the BC MoE draws from the land systems approach described by Lacate (1969) and Wiken and Ironside (1977) which emphasizes landform when delineating ecosystems for evaluation (Pojar *et al.* 1987). The difference in emphasis makes these two approaches useful for different purposes.

The MoF uses the biogeoclimatic system mainly to facilitate timber management decision making. Timber managers can use the system to identify and describe sites, and then to assist in choosing tree species for reforestation, or deciding if post-logging prescribed burning is appropriate (Green *et al.* 1984; Klinka *et al.* 1984). Recently, Klinka and others (1990a) have developed timber harvesting guidelines using the biogeoclimatic classification as one basis.

The classification has also been used to interpret wildlife (Mitchell *et al.* 1981; Pojar 1984) and recreation values (Inselberg *et al.* 1982) for some areas. These interpretations are based both on current status and predicted successional change, and incorporate vegetation and soil characteristics. Information about successional pathways of forest ecosystems is valuable for recreation and wildlife capability rating over time as vegetation changes (Pojar *et al.* 1987). However, the biogeoclimatic system does not incorporate explicitly spatial patterns of biophysical systems which provide clues about habitat diversity for wildlife. Also, terrain and soil characteristics enter the classification at the site level which enables site specific management decisions, but limits the utility of the system for land allocation decisions.

Biogeoclimatic research has focused on timber management applications. This research provides indirect information that could help determine the feasibility of managing a site for timber. For example, if the recommended harvesting method is expensive, and seedlings of some tree species for regenerating the site are difficult to obtain or expensive, one might conclude that the site has poor timber management feasibility. Ecosystem data necessary for capability interpretations for other land uses are collected for biogeoclimatic identification. However, the interpretive frameworks for activities other than timber have not been developed to the same extent as under the MoE biophysical system.

The initial stage of biogeoclimatic classification is now virtually complete. This stage involved the mapping of biogeoclimatic zones, subzones, and variants, that is , the zonation of land primarily on the basis of climate, and writing of field guides to assist in ecosystem identification and interpretation (Meidinger 1990 pers. comm). Mapping and classification occurred at various scales: 1:2 million for zones, and 1:100,000 to 1:500,000 for subzones and variants depending on the detail needed. Each of the 6 forest regions now has a guide for site identification which includes site preparation, tree species selection, and in some areas, wildlife and range interpretations. This phase of biogeoclimatic classification took about 13 years, and cost $12-14 million (Meidinger 1990 pers. comm). The biogeoclimatic system will continue to undergo revisions as new needs arise, and to form the basis of research and classification of timber and non-timber (particularly wildlife and range) resources.

3.4.2.3 Recreation and Tourism

The MoF is responsible for outdoor recreation management on Provincial forests, which cover 85% of BC. The recreation inventory comprises two classifications: the first of recreation activity opportunities and sensitivity of recreation to other resource development; and second, of landscape aesthetics.

The recreation activity inventory roughly follows the format of the CLI classification, and subsequent work done by the MoE (Block and Hignett 1982). CLI recreation maps are still used for planning in BC (Block and Hignett 1982). However, two limitations of the CLI reduce its utility.

First, CLI ratings combine the ability of land both to attract and support recreation. The mapped classification focuses specifically on opportunities offered by the land, omitting biophysical limitations to carrying capacity and use (Block and Hignett 1982). The MoE outdoor recreation classification (Block and Hignett 1982) rectifies this by separating these two aspects of recreation capability.

The second limitation is that since the CLI, social preferences have changed. Activities unforeseen by the CLI compilers, such as heli-skiing, heli-hiking, and back-country skiing, are now popular. These new demands mean that CLI maps do not provide all information necessary for current recreation planning.

The classification used by the MoF notes the sensitivity of recreation to timber development, not the sensitivity of land to (or carrying capacity for) recreation. In this sense it differs from the proposed classification of the MoE (Block and Hignett 1982). Before activities not included in the CLI are incorporated into the recreation inventory, new evaluative criteria must be developed.

The landscape aesthetics inventory records both visual quality objectives, that is, the degree to which evidence of logging is acceptable, and the sensitivity of aesthetics to landscape modifications such as logging (BC MoF 1981). Landscape information is most relevant for development planning along travel corridors and near recreation areas or settlements.

Recreation and landscape aesthetics inventories are updated as Timber Supply Area (TSA) plans are reviewed and rewritten approximately every 5 years. Since about one-fifth of the TSA plans are redrafted every year, the objective is to revise the provincial inventory every 5-years (Murray 1990 pers. comm). The policy of updating recreation inventories for TSA planning began in 1982/83. A current objective is to complete the inventory to reflect planning needs within 5 years (1995), and to digitize these data into a GIS (Murray 1990 pers. comm).

Revising and filling-out the recreation inventory will require funds and staff. Currently, the Recreation Section receives about 0.7% of the MoF budget (BC MoF 1990a). Completion of an inventory framework that will serve as a basis for future revisions may require more resources than have been available historically (Murray 1990 pers. comm). However, no accurate estimates were available.

Besides the MoF, other agencies have interest in tourism planning. The BC Ministry of Crown Lands, together with the MoT, has sponsored recreation planning to zone areas to guide its land leasing program. MoT objectives are less development oriented; it uses recreation and tourism capability information to support its advocacy of such activities for both their economic and leisure potential.

The work of MoCL and MoT will assist in expanding the scope of recreation inventories and capability analyses to activities not included in the CLI, and to areas not covered by the MoF. An example is a MoCL study attempting to define potential back-country recreation development zones for the Whistler area in southwestern BC. In this study, Careless (1990) overlays requirements for activities such as heli-skiing, heli-hiking, and back-country skiing with biophysical land characteristics (terrain, climate, vegetation) to delineate areas with biophysical capability to support the uses. He also uses current ownership and land use to define areas with suitability for each activity, and finally, socioeconomic factors, such as access and infrastructure, to decide on areas where recreation would be feasible. The BC Ministry of Tourism (MoT) is compiling a catalogue of biophysical requirements for various activities to facilitate recreation planning (Gryzbowski 1990 pers comm).

3.4.2.4 Range Resources

The Range Section of the MoF Integrated Resources Branch manages research, classification, and inventory, as well as users, of range resources. Very little of the range resource has been inventoried. Users of range data, including cattle ranchers and wildlife managers, require information both on the location and productivity of range (Campbell 1990 pers. comm). This information is currently scarce. Attempts to link range productivity to forest cover have proven fruitless; therefore an inventory and classification system specific to range is now being developed based on the biogeoclimatic system (Campbell 1990 pers. comm).

In addition, a habitat monitoring manual jointly written by the MoF and MoE Wildlife Branch should be completed in late 1990 (BC MoE/MoF 1990; Campbell 1990 pers. comm). This manual will assist in standardizing range and wildlife habitat data collection, and avoiding duplication of effort. The manual will include guidelines for collecting information on cattle and wildlife utilization, seeding, tree planting, and herbicide use as they affect range conditions.

In general, range classification and inventory are at an early developmental stage in BC. How far such activities will extend, in terms of both theoretical development and geographical coverage will likely depend on the importance given to range resources relative to other forest values during budget and staffing allocations.

3.4.3 Conservation Planning in the BC Ministry of Parks

BC Parks is in the process of developing a systems plan to guide completion of the protected area system. The Ministry of Parks (MoP) has approached this by proposing division of BC into 59 representative landscapes (BC MoP 1990a), and a list of 519 special features (BC MoP 1990b). Landscape delineation involved combining biogeoclimatic (Pojar *et al.* 1987), ecoregion (Demarchi 1987, Demarchi and Lea 1989a), and physiographic classifications, as well as the criterion that the general public should be able to discern the difference among landscapes (BC MoP 1990a). There are similarities between the landscape classification and those used to design it, but the overlap is not complete. The MoP designations are still at the discussion stage. Some agency interests feel that the more strictly ecologically based ecoregion and biogeoclimatic classifications would be more suitable than the MoP proposal to guide the BC Parks goal of preserving a cross-section of ecosystems. However, discrepancy between the MoP classification and the ecoregion and biogeoclimatic classifications is not perceived as large within MoP (Munn 1990, pers comm). Initial conceptualization of the representative landscape classification was at a small scale (1:2 million); as larger scale mapping and ground checking takes place, correspondence between the systems will likely increase (Munn 1990, pers comm).

The representative landscape classification, when finalized, will assist in determining which parts of BC are under- or unrepresented in the current parks system. This knowledge will help in setting priorities for land acquisition, and in developing land use zoning and management strategies in consultation with other resource agencies. The MoP is currently working on evaluative criteria for potential representative areas. This a recent initiative in BC, and the theoretical literature does not offer a consensus position on which criteria to use, or how to combine them (Gotmark *et al.* 1986; Smith and Theberge 1986). To ensure that protective allocation of land is rational, conservation evaluation will require much work in BC.

3.4.4 Assessing Mineral and Energy Potential in the BC Ministry of Energy, Mines, and Petroleum Resources

The BC MoEMPR has the dual role of encouraging and regulating discovery, development, and production of energy, mineral, and petroleum resources (BC MoEMPR 1984). Mineral or energy exploration, production, and transport (pipelines, electricity transmission) are frequently incompatible with other land uses. Yet the social demand for minerals and energy is undeniable. One purpose of the MoEMPR, therefore, is to ensure consideration of these demands during land use decision making. The current ministry position is to resist park and other protective designations in the area before mineral or energy potential has been assessed; that is, to avoid making land use decisions without considering the full range of resource options (BC MoEMPR 1990). Several MoEMPR inventories provide an initial overview of this potential.

Mineral inventory maps at 1:126,720 (1 inch to 2 miles) and 1:250,000 show both bedrock geology and known mineral occurrences. This information is entered in the MINFILE database, and is updated yearly. Regional Geological Survey Branch geologists (there are 8 in BC) do larger scale (1:50,000) mapping on an ongoing basis (BC MoEMPR 1988; Fontaine 1990 pers. comm). The Assessment Report Index System (ARIS) stores data on mineral claims. ARIS includes information on claim ownership and exploration and development activities at 1:126,720 or 1:250,000. The Mineral Titles Branch of MoEMPR has 1:50,000 information on claim locations. Geochemical survey data from analysis of stream sediments are available on 1:250,000 maps and computer diskettes for roughly 40% of the province (BC MoCL no date). Finally, the ministry compiles maps delineating major sedimentary basins (petroleum), and broad areas having potential geothermal, mineral, or coal resources (BC MoEMPR 1984: 22-25).

All of this information is useful in land use discussions. However, most data are for potential not actual occurrences. Exploration is still required to locate actual deposits (Fontaine 1990 pers. comm), and therefore highlight areas where deciding on a land use allocation will entail trade-offs: that is, mining will, for at least a while, make an area unattractive for most other uses; not mining will mean foregoing economic returns from the mineral resources. Funds are not always available for the ministry to undertake such exploration, or encourage private industry to do so. Through its guidelines for mineral exploration (BC MoEMPR 1989), the ministry attempts to ensure that exploration activities follow legislated requirements, and have minimal negative environmental impact.

MoEMPR does not have a resource planning mandate, meaning district offices are small with few staff available to attend inter-agency planning meetings (Fontaine 1990 pers. comm). Inventory databases, to some extent, overcome staff limitations by providing some mineral and energy information for use by planning staff from other agencies.

3.5 Using Biophysical Information in Land Allocation - Timber Supply Area Planning

The biophysical classifications and inventories discussed above are widely used in determining land use allocations in BC. Location of agricultural land reserves, and integration of timber, wildlife, fisheries, and recreation concerns in local resource use planning processes such as in the Tsitika watershed, were discussed earlier. Biophysical capability was an important factor in locating Tumbler Ridge for the Northeast coal project (Quin 1979). Candidate areas for the parks system will be evaluated largely on the degree to which they are biophysically representative of some area of BC (BC MoP 1990a). Attempts are made to locate roads and highways in areas of stable slopes and moderate terrain to minimize water body sedimentation, slope destabilization, and road building costs (Howes and Kenk 1988). Where roads cannot be optimally located, biophysical information is useful for delineating areas requiring management strategies to minimize potential for damage (eg. buffer strips, retaining walls).

A particularly important use of biophysical analysis in BC is in Timber Supply Area (TSA) planning. During TSA planning, the allowable annual cut or timber harvest (AAC) for an area is determined. The MoF apportions the AAC for the TSA to different forest companies in fairly long-term (15-20 year) licenses. Since 65-70% of the provincial AAC comes from TSAs, and overall the MoF has jurisdiction over 85% of provincial land, it is clear that allocative decisions at the TSA level are important determinants of resource use patterns in BC. This sub-section examines how some of the biophysical inventories previously outlined in this section are used in TSA decision making.

The MoF has specific responsibility for timber, range, and recreation in provincial forests (BC 1979a). MoF is also mandated to integrate concerns of other government and private resource interests into its plans. In general terms, the goal of TSA planning is to reach a balance among the resource management goals and objectives of all resource interests either through land allocations or land management techniques, such as silviculture or landscape planning. Four documents are produced during the TSA planning process: the timber supply analysis information report provides technical data on how different land allocation strategies and management regimes affect the timber inventory; the timber supply analysis summarizes the information report; the options report, a focus for public comment, summarizes timber and non-timber resource supply impacts of the various land allocation and management options; and a draft plan discusses how the proposed plan addresses resource management issues in the TSA. The focus of all of these documents is the timber supply implications of alternative land allocations or management strategies; that is, for example, how increased emphasis on wildlife protection or increased expenditure on silviculture would affect the long run sustainable yield of commercial timber (LRSY).

A critical determination in TSA planning then, is the land base assumed to contribute to the LRSY: that is, the "operable" forest. Several factors are considered when defining the operable forest land base: the timber inventory (timber volume, age, and site quality); information on environmentally sensitive areas; economic and technological considerations; and area-specific knowledge of government and forest industry planners. Determination of the operable forest area entails subtracting the following from the total forested area (BC MoF 1988b; Lang 1990 pers. comm; Thomae 1990 pers. comm):

1) areas not satisfactorily restocked (NSR) or with doubtful stocking (DSD) after a disturbance;
2) areas growing non-commercial brush species (NC);
3) roads and other rights-of-way;
4) areas of low forest productivity (low sites);
5) deciduous forest areas, if these are not harvested commercially in the TSA;
6) areas which are physically inaccessible or have significant non-timber values (wildlife, fish, recreation, avalanche protection, watershed), potential post-logging regeneration problems, or soils with high sensitivity to logging. These areas can be recorded in the timber inventory as ESAs (environmentally sensitive areas) or

delimited during discussions between MoF and other agencies or interest groups; and

7) areas not economic to harvest given current technology and markets (ie. beyond the 'operability lines' drawn by MoF and industry).

Land in the operable forest base is assumed to contribute to the allowable annual cut (AAC) for a TSA.

For some of the above reductions, including NSR, DSD, NC, low sites, and deciduous species, fairly clear definitions guide the process of netting down the total productive forest to the operable area. For others, particularly defining operability lines and deciding ESA reductions, guidelines are more vague and require judgement by government planners (Lang 1990 pers. comm; Thomae 1990, pers. comm).

For example, ESA codes specify the type (wildlife, recreation, watershed, soil, regeneration, avalanche, inoperable), and degree (moderate or high) of constraints to timber harvesting. Areas with ESA codes are assigned reduction factors which represent the percentage of those areas planners feel should be removed from timber production. BC MoF documentation provides guidelines for mapping and classifying ESAs (BC MoF 1984), but not for assigning reduction factors. The reduction factors vary depending on the specific area, and the type and significance of the concern. For example, areas with moderate soil sensitivity may be netted down by 60%; areas with highly significant wildlife habitat may be reduced by 90%. Further, two areas with a moderate soil sensitivity rating could have different reduction factors (eg. BC MoF 1988b).

The judgements involved in assigning ESA significance and reduction factors, or delineating inoperability lines are based on combined expert opinion and experience within TSA planning committees. However, the rationale behind the judgements is not documented in TSA reports (eg. BC MoF 1988b).

Several options are considered for the TSA land base. These normally include: retaining the status quo; providing access to areas previously considered inoperable; reducing or extending harvest age; increasing silviculture or protection (fire, disease) expenditures; expanding land area reserved for fish or wildlife habitat; and maintaining or increasing recreation opportunities (BC MoF 1990b). Each option is analyzed for its effect on: the operable forest land area, AAC, LRSY, and currently available timber volume; type and quantity of recreational land; range resources, if important in the TSA; and wildlife populations and habitat area (BC MoF 1990b). The provincial chief forester considers "technical and socioeconomic" factors in deciding which option to approve (BC MoF 1989b).

The final plan documents how various issues in the TSA will be addressed through plan activities. The TSA is zoned for various management emphases, including timber production, wildlife, recreation and viewing, preservation, and areas requiring more in-depth local resource use planning (BC MoF 1989b). Each zone is subject to different management strategies. For example, a community watershed could be zoned for timber production, but only a certain percentage of the forest cover could be removed over one time period. Recreation emphasis areas would be subject to landscape logging techniques. In wildlife areas, some sections would be deferred indefinitely from logging.

The primary socioeconomic considerations relate to direct MoF responsibilities: current license agreements with forest companies; local economic reliance on timber for jobs and income; and projected demands for range and recreation. The analysis reports, options reports, and plans do not quantify the social or economic benefits or costs expected to accrue to people or communities in the TSA due to timber harvesting, silvicultural investments, range expansion, reservation of wildlife habitat or other potential land uses. For example, in the Robson Valley TSA draft plan, operability lines were based on the cost of wood delivered to mills (BC MoF 1989b). It was decided that the socioeconomic consequences would be disastrous if operability lines were not extended to include timber with significantly higher than historical delivered costs. The document did not list the actual number of jobs potentially affected if the operability lines were not extended, or estimates of changes to mill profitability if the lines were extended. In general, assumptions that changes in production levels of biophysical factors - timber, rangeland, wildlife habitat - will have socioeconomic effects underlie TSA planning. However, estimates of the predicted effects are not quantified; for example, the number of jobs potentially affected by reservation of 10,000 ha for wildlife habitat. The possible effects of market demands and product prices on socioeconomic variables are not discussed or documented. Further, the location of assumed benefits or costs is not listed; for example, will jobs be created or lost in the TSA, or elsewhere.

The land allocation and management alternative chosen during TSA planning is important in determining the nature and quantity of biophysical and socioeconomic benefits that will be produced in BC. Deciding how much land to apportion to various uses involves consideration of a wide range of information, including timber and non-timber inventories, as well as some economic and technological factors. However, the assumptions and analytical techniques used to combine this information are not always explicit. Further, the socioeconomic benefits and costs expected from a plan are not quantified. Therefore, the socioeconomic trade-offs among various plans are not clear.

3.6 Summary

A wide range of information in manuals, classifications, and inventories is available to assist biophysical planning in BC. Soils, minerals, terrain, fisheries, wildlife, outdoor recreation, vegetation, representative landscape, and biogeoclimatic information, as well as the somewhat dated CLI ratings are currently used. The BC government classifications and inventories discussed are summarized in Table 3.3. The variety of information is due largely to the wide range of resource planning and management objectives among government agencies, and the diverse approaches and foci of resource specialists often working in relative isolation.

Most biophysical mapping and classification systems can be used at different scales for either broad land use planning, or management design. Resource inventories, however, are mostly on scales designed for regional and sub-regional (watershed) land use planning. Few inventories are adequate for current planning, an indication of the relatively recent recognition for their need. Therefore, integrated resource planning often relies as much on experience and intuition as on inventory data.

A notable gap in the list of inventories used by resource planners in BC is socioeconomic information. Resource specialists tend to base their analyses on biophysical data. Socioeconomic benefits and costs are not specified, but are assumed to follow from biophysical resource production.

This section has not included a comprehensive overview of resource classifications and inventories used in BC. The diversity of interests and government agencies involved, as well as the rapidly developing focus on biophysical resource inventories within government agencies, made this an elusive and ultimately unreachable objective. However, this overview of biophysical classifications and inventories in BC highlights first, the diversity of information needed for resource planning; and second, the unlikely prospect, given limited human and financial resources, that all desired information could be collected at any one time.

The Forest Resource Commission (FRC) in its interim report noted that at least 10 BC agencies have resource inventories which are largely inadequate and incompatible (BC FRC 1990). This paper supports these conclusions. But to them it adds the following two points. First, those involved in resource management administration in BC well know the limitations of the existing information base, and the historic incompatibilities in data collection, compilation, and storage. However, they have been working at rectifying these shortcomings, as the MoCL Corporate Land Information Strategic Plan, and several inter-agency initiatives, such as ecosystem sampling, habitat monitoring, and wildlife/ forestry research, show.

Second, the complexity of resource management precludes a conclusion that inventories simply need to be completed, or made adequate. Both the number of interests involved and the dynamic nature of biophysical and socioeconomic systems mean inventories can never be complete. Restricted budgets mean some, not all, information bases could be improved to comply more closely with current planning needs. Deciding on which resources to concentrate will itself require planning. Resource planning requires an inventory process or program, not simply inventories of static information. These ideas are expanded in the following section which examines the advantages and limitations of biophysical analysis in general, and of current practice in BC.

Table 3.3 Summary of biophysical classifications and inventories in British Columbia.

Resource	Agencies Responsible	Classifications/ Guidelines	Comments
Conservation	BC MoP	Representative Landscapes; Representative Features (BC MoP 1990a,b)	Classifications are in public comment and review stage. Currently, 59 landscapes and 519 features. Criteria for evaluating candidate areas or features for protection to be developed.
Fish habitat	BC MoE Fish and Wildlife Branch	Stream Information System (SISS) (Canada DFO 1989)	SISS contains data on fish (population, life history), and management activities. Some data are digitized; some available in Stream Summary Catalogues (Canada. DFO 1990) Salmonid species only.
	Canada Dept of Fisheries and Oceans		Emphasis on reconnaissance inventory (1:50,000) and research to allow extrapolation of data from surveyed to unsurveyed streams.
		Coastal Fish/ Forestry Guidelines (BC MoE/MoF 1987)	Provide general guidelines for logging operations. Stream reaches classified according to topography, and presence of fish.
Range	BC MoF	Habitat Monitoring Guidelines (BC MoE/MoF 1990)	Little inventory work done. MoF has contract out to develop a range classification based on the biogeoclimatic system.
Recreation	BC MoF (also MoCL, MoT, and MoP)	Outdoor Recreation Classification (Block and Hignett 1982; BC ORC 1990)	MoF responsible for recreation on provincial forests (85% of BC). Recreation inventory updated during TSA planning; ie. every 5 years. Goal to have provincial coverage by approx. 1995.
Terrain	BC MoE (with MoF and forest industry)	Terrain Classification System for BC (Kenk and Howes 1988)	Mapping done by MoE, MoF, forest companies, and contractors. No central data repository. Approximately 1/3 of BC mapped at 1:50,000. Many planning needs for more detailed mapping.
Timber	BC MoF	Forest Cover	Includes tree species, volume, age, and site quality (based on current stand, not site capability). Entire province is inventoried.

Table 3.3 (cont.)

Resource	Agencies Responsible	Classifications/ Guidelines	Comments
Timber (cont.)		Biogeoclimatic (Pojar et al. 1987; MacKinnon et al. 1988)	Zone and subzone mapping (1:100,000 to 1:500,000), guides to ecosystem identification completed for province. Include management interpretations - primarily silvicultural (site preparation and tree species for regeneration); some range and wildlife.
Wildlife	BC MoE (BC MoF assists)	Biophysical Habitat Classification (Demarchi et al. 1983; Demarchi and Lea 1987) Habitat Monitoring Guidelines (BC MoE/MoF 1990)	Emphasis on ungulates, with interest expanding to non-game species. Estimated $18 million to complete 1:250,000 reconnaissance, and 1:50,000 critical area mapping. MoE and MoF cooperate in Integrated Wildlife Intensive Forestry Research program.
Water	BC MoE Water Mgmt. Branch (BC MoF assists)	Water Quality Criteria (WQC) Water Quality Objectives (WQO)	WQCs set for 12 substances; 8 forthcoming. WQOs set for 26 areas; 21 in preparation. Guidelines outline general planning considerations for resource development in watersheds.
		Guidelines for Community Watersheds (BC MoE 1980)	Integrated Watershed Management Plans completed for 5 community watersheds; 5 in progress. Staffing and budget limitations preclude IWM planning in some areas.
Energy, Minerals	BC MoEMPR	Mineral Inventory Mapping (MINFILE)	1:126,720 and 1:250,000 maps of known mineral occurrences. Computer database for about 50% of province (BC MoEMPR 1989). Updated yearly.
		Assessment Report Index System (ARIS)	Claim locations, exploration and development activities. 1:126,720 and 1:250,000 maps and computer database. Mineral Tenure Branch has 1:50,000 data on claim locations.
		Regional geological mapping.	1:50,000 mapping of bedrock geology and mineral potential.
		Geochemical survey data	1:250,000 data on geochemical stream sampling. Maps and computer diskettes available for 40% of BC.
Data and Computer System Coordination	BC MoCL	Corporate Land Information Strategic Plan (CLISP) (BC MoCL 1989)	Goal of CLISP is to develop policies, guidelines, and procedures to standardize resource data collection, analysis, and storage, to facilitate information sharing among resource management agencies. CLISP is conceptually developed, but not fully implemented.

Section 4 Evaluation

4.0 Introduction

The purpose of this section is to evaluate biophysical analysis as a technique for assisting in the allocation of land among competing uses. Five evaluative criteria are described, and then applied to biophysical analysis in general, and to its current practice in BC.

4.1 Evaluative Criteria

The following criteria for evaluating analytical methods were adapted from McAllister (1980) and Bastedo and Theberge (1983):

1) Systematic: The steps taken and criteria used in progressing from issue identification through data collection and decision making should be explicitly documented. This is important to ensure other analysts can replicate the analysis, and that information and decisions are defensible. Standardized data are also required to facilitate GIS analyses and inter-agency planning.

2) Understandable: Information, concepts, and logic should be understandable and easily communicated to decision makers and the public. Trust in information is often a function of how well understood it is.

3) Economically effective: The time and money spent collecting and analyzing information should be justified by the degree to which planning and decision making are facilitated.

4) Comprehensive: The technique should incorporate all factors relevant to the issue or problem.

5) Decision-oriented (applicable): Both the method and information should facilitate decision making. The method should provide guidelines or rules on which to base interpretations and decisions. Information must be of the appropriate type and detail.

4.2 Evaluation

4.2.1 Systematic

Resource planning involves many government agencies and private interests. It is facilitated if biophysical data are of comparable accuracy, and format. Further, GIS will produce accurate results only if data of comparable scale, collected using similar techniques and a common geographic reference map, are used (Bailey 1988). Difficulties caused by different approaches to data collection have been recognized in BC at least since 1980. Since then, guidelines for describing ecosystems (Walmsley *et al.* 1980; Luttmerding *et al.* 1990), mapping terrain (Howes and Kenk 1988), and monitoring range (BC MoE/MoF 1990) have helped to make biophysical data and subsequent analyses more systematic by ensuring data comparability.

However, while data collection has become increasingly systematic, data compilation has not. The BC resource mapping inventory (BC MoCL 1990) lists publicly available maps, but does not provide a comprehensive overview of all resource information. For example, information on government agency computer databases, and resource industry inventories is not centrally compiled. Except perhaps for timber, there are no central data repositories or networks outlining how much information exists, and how it can be obtained. Work on the Corporate Land Information Strategic Plan by the BC MoCL (1989) may help to improve coordination of data compilation.

Classification of land into homogeneous ecological or land capability units is also frequently unsystematic. Lack of systematic classification criteria precludes replication of classifications, and understanding of how boundaries were located. For example, integrated ecological classifications, such as for ecoregions (Demarchi 1990) and representative landscapes (BC MoP 1990) attempt to delineate ecologically homogeneous areas as a basis for wildlife habitat and ecosystem conservation planning respectively. The general biophysical components considered are described (climate, soils, geology, topography, vegetation, wildlife). However, exactly how these components are combined to formulate biophysical classes is not made explicit. Since there is no single widely accepted approach to biophysical classication, future understanding of ecosystem delineations requires that criteria are explicit.

Classification criteria for delineating areas of homogeneous capability based on specific land use requirements are often more explicit than for integrated classifications. For example, the BC MoF Inventory Manual (BC MoF 1984) outlines how to classify environmentally sensitive areas (ESAs) not suited to timber harvesting. Similarly, CLI classifications provide definitions for specific land use capability ratings. Specification of criteria for capability is easier than for ecosystem boundaries, since land use capability normally hinges on one or a few, rather than many, variables. However, many capability classifications are still based on broad qualitative criteria, leaving much up to the judgement of an analyst. More explicit criteria increase the ability to replicate the classification, and to evaluate its accuracy in predicting use capability.

Finally, the way in which biophysical information is used in land use allocation or management decisions is often inexplicit. An example discussed in this paper is the delineation of operable land during TSA planning. BC MoF manuals outline ESA classification methods, but provide no guidance on the extent to which ESAs should affect the timber harvest. Deciding on appropriate ESA reduction factors relies on local knowledge, precluding province- or region-wide prescriptions. However, while these locally defined reduction factors are listed in TSA information reports, methods used in their derivation are not documented.

For broader decisions, such as among alternative TSA plans, the use of biophysical information is again unsystematic. There are no guidelines outlining how land use decisions should be documented; for example, the types of resource trade-offs to be listed, or requirements for describing links between proposed land uses (timber harvesting, wildlife habitat) and expected benefits (number or jobs or animals). Future use and evaluation of information compiled or produced, and of decisions made during biophysical analyses is difficult when methodologies are unknown.

4.2.2 Understandability

The general concept that biophysical capability is a basic requirement for the success and sustainability of any land use is easily comprehended. For example, basing the BC Agricultural Land Reserve on the biophysical capability of high quality agricultural land to grow crops was easy to understand; successful farming requires good soil.

Information presented in simple map overlays can show clearly the location of different resource values to help allocate land to appropriate uses, and highlight potential conflict. Such techniques have been used in local resource use planning in BC, such as in the Tsitika watershed, and during power planning in the US Pacific Northwest, to facilitate involvement of the various stakeholders in highlighting resource values and evaluating land use alternatives. Knowledge of potential conflict can help to focus planning and study efforts in order to find solutions. Biophysical analysis therefore can provide clear, comprehensible techniques and rationale for some land allocation and management decisions, the involvement of stakeholders in resource planning, and the setting of study priorities.

However, the process of classifying and evaluating biophysical resources, and of deciding among competing land uses is sometimes complex and often not easy to understand. For example, combining many variables onto one map, manipulating data without clear reasoning, or presenting large quantities of data can hide information and cause confusion rather than clarify a land use issue. Further, such lack of clarity might cause those interests already skeptical with a proposed development, or with the planning process in general, to become increasingly suspicious.

For decision makers and the public to understand the methodologies and rationale of biophysical analysis, resource planners must communicate their techniques and tools. There is some relatively easy to understand literature on some management tools used in BC, such as the biogeoclimatic classification (Klinka *et al.* 1990b). However, in general there is a lack of information on how resource managers manipulate and use biophysical information. A simplified description of land use allocation processes and techniques used would greatly increase the comprehensibility of biophysical planning in BC.

4.2.3 Economic effectiveness

Biophysical analysis has good potential to increase the economic effectiveness of planning and decision making. It can also assure that the fundamental requirements for biophysical productivity or resilience to damage are met, and thereby help to avoid the expense of land degradation and failed ventures. For example, an important consideration in locating Tumbler Ridge for the Northeast coal project was to avoid areas subject to flooding, thereby minimizing potential for property damage.

Initial biophysical analysis can improve planning effectiveness by focusing research and decision making efforts. An overview of resource values can assist in identification of potential conflict areas requiring more detailed study to devise special management techniques, or allocate land to avoid conflict. For example, the proposed Robson Valley TSA plan (BC MoF 1989b) outlined high conflict areas for intensive local resource use planning. This allowed analytical resources to be utilized more cost effectively by concentrating them on conflict areas, as opposed to disspersing them on the whole TSA. Another example is the Whistler back country recreation study. Here, Careless (1990) showed that some land use conflicts were unnecessary since requirements for different uses were met in different areas. By outlining relatively conflict free areas for resource development, such studies can help ensure development planning efforts and resources are used productively, and not diffused in unnecessary conflicts.

For biophysical analysis to be economically effective, the information collected must be relevant to the decision making problem and useable by planners and decision makers. Development of biophysical inventories could be economically ineffective if: (1) unneeded information is collected; (2) critical data gaps were ignored in favour of supplementing less critical or already more adequate information; or (3) if data were collected but not interpreted and entered into accessible databases in a format useful to resource planners and managers.

Inventorying all biophysical components at many scales when such data are not required does not constitute wise expenditure of time and money. If, however, these data can be used in future studies, or as bases for scientific hypothesis formulation and testing, this expense may be justified. In this case, collection of all data during one field work project might be less costly than collection in separate sessions. Further, technological developments in GIS and remote sensing are decreasing the costs of information collection and updating. Therefore, deciding which data to collect may be less of an issue in the future.

The discussion of classification and inventories in BC (Section 3.4) highlighted the numerous gaps in the current resource information base. There is a danger that the filling of these gaps might proceed in an unsystematic manner, and involve ineffective and therefore uneconomic expenditures on information gathering. Effective expenditure on biophyscial inventories will require coordination among the resource agencies involved to identify and fill the most critical data gaps.

Most users of biophysical information require resource interpretations, not raw data. Therefore it is important that information collection is followed by interpretation and compilation so that data are available and easy to use.[1]

4.2.4 Comprehensiveness

A major limitation of biophysical analysis as a planning tool is its lack of comprehensiveness. Biophysical analysis excludes factors significant in making land use decisions, such as relative supply and demand for resources, and other socioeconomic variables. Further, knowledge of biophysical systems is incomplete, meaning land capability assessments may not include significant biophysical components.

The value of pursuing a land use depends on the relative supply and demand of the goods and services provided. If the supply of high quality moose habitat exceeds that needed to maintain the population, the value of one habitat unit would be lower than if habitat was limited. In an area of relatively scarce habitat, a unit of low quality may be critical to the moose. Similarly, licensing an area for timber extraction when demand and prices do not justify logging may result in economic losses. If binding contracts are entered that require a certain annual timber harvest, and facilities are built to process the increased supply, regional employment may suffer in the long run if the timber harvest is not sustainable. Information on inherent biophysical capability does not recognize these links between land use value and relative supply and demand.

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[1] **Some resource stakeholders may feel, however, that the raw data should still be available to allow either future re-interpretation or scrutiny of existing interpretations.**

The ability of land to support any land use economically, legally, and administratively depends on non-biophysical attributes, such accessibility of markets, current land use or tenure arrangements, and existing investment in infrastructure. The difference between inherent biophysical capability and administrative suitability or economic feasibility is crucial in planning. The ability for biophysical resources to support a use does not always justify the expense of building new infrastructure or acquiring the land entailed in switching to another use. For example, the BC ALR may have met physical objectives of protecting agricultural land from irreversible non-agricultural development. But due to a lack of economic considerations, its objective of encouraging actual agriculture use of ALR land remains unmet (Canada. Environment 1978).

Socioeconomic and cultural implications of alternative land use plans should be an important consideration in all planning processes involving public resources in BC. Currently, these implications play a minor role in resource planning. For example, MoF Timber Supply Area plans are concerned primarily with timber supply, as well as other biophysical resources such as wildlife, range, and recreation. Changes in timber supply do affect socioeconomic variables such as employment and public revenue. However, managing for timber supply and assuming socioeconomic benefits will follow is a crude way of incorporating socioeconomic concerns into resource management. More explicit inclusion of socioeconomic and cultural considerations would clarify trade-offs involved in alternative land use allocations.

Land use decisions will be only as good as the information on which they are based. Particularly on large time and space scales, current ecological knowledge severely limits accurate prediction of all land use and management effects. Interactions among land units in the form of material and energy transfer, and the ecological effects of disturbances such as fire, wind, insect infestations, and climate change have only recently become the focus of research in North America (Turner 1989; Urban *et al.* 1987). Additionally, the effects of alternative management practices on different biophysical resources has received limited attention in BC. In some cases, conflicts may stem more from the way resource development is practiced than from inherent incompatibilities between land uses. For example, different timber harvesting techniques have the potential of resolving some conflicts between industrial forestry and recreation, fisheries, or wildlife. Continued research into ecological processes, and alternative management techniques is needed to improve our predictive and design capabilities.

The extent of resource development in BC implies the need for extensive inventories of many ecological features and processes to determine land capability and highlight potential inter-resource conflicts. While classification and inventory methodologies exist for most resources, inventories are far from adequate, as the discussion in section 3 indicated. Fish and wildlife habitat, terrain, range, recreation, timber, and representative landscape and features inventories, as well community watershed planning and water quality objective-setting all require work. Some inventories may need to be revised and greatly expanded in light of changing values. For example, the wildlife inventory will need to include non-game species, and the timber inventory made require reworking to incorporate old-growth values. Continuously shifting priorities mean inventories will always be partially out of date. But, as we move from a focus on resource development to integrated management, compiling and maintaining inventories of all resources will require more priority than in the past.

While work is required on resource inventories, it should be recalled that biophysical systems are dynamic, and that socioeconomic variables affecting resource planning change rapidly relative to abilities to update inventories. The ability for remote sensing and aerial technologies to facilitate resource data updating could be used to help keep biophysical inventories in pace with biophysical and social change (eg. Morin *et al.* 1986).

4.2.5 Decision orientation

A major deficiency of biophysical analysis is that it is not decision oriented. Results of analyses consist of large quantities of information, but there are no clear or consistent rules to guide decision making. For example, guidelines such as "maintain ecological sustainability" or "avoid excessive soil erosion" do not tell decision makers how to interpret the data presented to them. Decisions must be based on explicit criteria.

Decision rules must follow from social, political, and scientific discussion through which resource use and management issues, broad goals, and more specific quantitative objectives are defined. Biophysical information does not in itself indicate the optimum land allocation. For example, CLI ratings cannot be used to conclude that land rated as class 2 for agriculture and class 3 for forestry is better allocated to agriculture. Evaluative ratings for different land uses are not comparable in this way. Decision rules must be based on values that guide how biophysical information is used during decision making. If, for example, a value decision is made that good agricultural land is too valuable to convert to other uses, the biophysical information can be used to locate and reserve such land.

Decision rules require quantitative or specific qualitative standards. In development of the BC ALR, the decision rule was to set aside all CLI class 1 - 4 agricultural land. For many social issues, for example, maintaining biological diversity or choosing areas for representative ecosystems, such rules do not yet exist. Furthermore, many issues involve a complex array of biophysical and socioeconomic considerations. Currently, there is no general agreement on decision rules or techniques for comparing the relative advantages of different land uses, or for combining biophysical and other information into inherent capability, current suitability, or socioeconomic feasibiliy ratings. If, for example, society comes to view maintenance of regional biodiversity as a goal, scientists may be able to develop measurement tools, and therefore offer clear guidance to decision makers. However, neither consensus on biophysical objectives, nor on measurement techniques currently exist.

More specifically, decision orientation is low when the data scale is inappropriate to specific decision making needs. Problems can result if small scale reconnaissance maps (1:250,000) are used to locate forest harvest blocks, settlements, mills, or roads in any but the broadest sense. Even 1:50,000 scale maps constitute only reconnaissance tools useful for focusing field work. In BC, there are many requirements for large scale (1:2,000 - 1:5,000) data (BC MoCL 1989). Therefore, a complete inventory of the province at 1:250,000 or even 1:50,000 will not address all planning and decision making needs.

Section 5. Conclusions and Recommendations

5.0 Introduction

This section begins with a summary of the evaluation of biophysical analysis developed in the previous section. Several recommendations directed to government agencies and other interests involved in planning the use and management of public resources are then discussed.

5.1 Conclusions

The advantages of biophysical analysis to resource planning are:

1) It can assist land use planning by inventorying important resource values in a cost effective manner, and by focusing research and decision making efforts. This requires that only relevant data are collected, that collected data are interpreted and compiled in a format useful to planners and decision makers, and that efforts are coordinated to avoid duplication, and ensure critical data gaps are filled.

2) Its underlying principle, that land should be used according to its biophysical capability, provides an understandable basis for land use decision making. This advantage relies on simple, clear communication and classification techniques, and presentation of all relevant data including decision criteria.

The limitations and concerns relevant to biophysical analysis are:

1) Its practice is often unsystematic. Decision criteria are frequently unclear or unavailable, and data collection and classifications of different disciplines are not coordinated. Standardization of data collection has been a priority in BC. However, work still remains to ensure data interpretation and compilation are systematic.

2) Biophysical analysis does not incorporate all variables relevant to land use planning, such as the relation between supply and demand, current land use and tenure, and

employment effects of different land allocations. Additionally, knowledge about the biophysical processes that determine land use capability and the nature of interactions among uses, as well as about the ecological effects of alternative resource management techniques, is limited. For example, the long term effects of various types of logging on soil productivity, or the effects on wildlife of different timber harvest patterns over time and space, are uncertain.

3) Biophysical analysis tends to be data oriented rather than decision oriented. It provides information for consideration, but little guidance on how to use the information for land use decisions. The applicability of biophysical analysis to planning and decision making also requires accessible, relevant information, and appropriately scaled data. Biophysical analysis provides information to help determine the best way to meet stated social goals and objectives. Biophysical information cannot dictate which goals or objectives to choose. However, even given stated social values, there is no general agreement on decision rules or techniques for comparing the relative advantages of different land uses, or for combining biophysical and other information into evaluative ratings.

5.2 Recommendations

The following recommendations focus on ways of ensuring that land use planning and biophysical analysis in BC are more systematic, understandable, economically effective, comprehensive, and decision oriented.

1) Initiatives to coordinate and standardize resource data collection, interpretation, and compilation, such as the Corporate Land Information Strategic Plan and ecosystem description and habitat monitoring guidelines, should be encouraged.

Systematic data collection and processing will ensure data compatibility, facilitate data compilation within a central, accessible database, and allow sharing of field work time and resources among agencies. Standardization is particularly crucial in integrated resource planning and management which involves many government agencies, industries, and other interest groups. Additionally, accurate results from GIS analyses depend on standardized data. Efforts should continue to ensure that all public and private interests involved in resource management in BC participate in coordinated data management.

2) Biophysical analyses performed by or for government resource agencies should follow systematic procedures, and include documentation of data sources, biophysical factors considered, rules used for combining data into capability classifications, and assumptions incorporated into recommendations and decisions. Guidelines manuals for these procedures should be published.

Systematic procedures and documentation will allow both effective evaluation and monitoring of implemented decisions, and use of the analysis in other planning processes.

3) The provincial government should provide clear information to facilitate understanding by the public and resource planners of government agency responsibilities for resources, the condition and extent of resource information, and research, planning, and management initiatives.

The fundamental basis of biophysical analysis - outlining inherent land capabilities - is generally understandable to decision makers and the public. However, administratively and technically, biophysical resource management is a complex endeavor involving many interests with both parallel and overlapping mandates. Land use planning and management discussions will be hindered if the people and organizations involved are unclear about the existence, location, or quality of resource information. Analytical work may be duplicated. Furthermore, setting priorities for filling gaps in resource inventories (see recommendation 4) will be difficult if the current state of biophysical information is uncertain. The resource mapping inventory of BC government resource information (BC MoCL 1990) should be more widely publicized, and where possible, expanded to include private sector data. Compilation by the Ministry of Crown Lands of a relatively simple overview of resource management responsibilities and initiatives, as part of the Corporate Land Information Strategy, would inform and clarify land use discussions in BC.

4) Priorities should be set on a government-wide basis for biophysical data gathering, interpretation, and compilation. Efforts should be concentrated on resource areas, for example, ecosystem conservation, range, and outdoor recreation, for which classifications and inventories are currently most limited, and therefore most needed to enable comprehensive planning. Information gathering and processing priorities will help ensure that large gaps in the resource data base are filled.

5) Resource information should be available in forms useful to decision makers and managers. This will require that data of appropriate scale are collected, that raw data are interpreted to correspond to land use planning needs, and that this information is available within an accessible computer network.

Compiling inventory information in a widely accessible geographic information system will also facilitate more comprehensive planning. Due to limited staff and financial resources, many agencies are not represented at planning meetings. While computerized data do not replace involvement of people, such data can facilitate consideration of a broad range of resources in land use and management discussions.

6) Socioeconomic and cultural variables should receive more attention during land use planning.

Biophysical analysis provides a required basis for planning by outlining the inherent or existing potential for land to sustain an activity. However, factors such as current administrative or legal status; forecasted market demand, commodity prices, or resource development costs; and employment effects of alternative land allocations, affect the feasibility and advantage of pursuing a given land use. More direct, and where possible quantitative, expression of the links between social goals and objectives, and production targets for biophysical factors (timber, range, minerals, wildlife) would clarify trade-offs, and help ensure social values are addressed. For example, sustaining timber growth at 75 million m^2 per year is, in itself, an inappropriate objective, unless this timber growth will support social goals and objectives, such as for employment or foreign trade. To ensure land planning is based on a comprehensive accounting of relevant factors, biophysical analysis must be complemented by socioeconomic and cultural analyses.

7) Support for research into the ecological processes underlying biophysical resource systems should continue.

Ecological knowledge forms the basis for determining both which biophysical factors most affect the capability for land to sustain different activities, and how different land uses affect each other. This knowledge is necessary to ensure that inventories provide a comprehensive accounting of the appropriate biophysical factors and processes; for example, that site quality data in the timber or wildlife habitat inventory actually represent capability to support timber or wildlife. Research is particularly needed in developing evaluative criteria for natural area conservation, and understanding how the interactions among areas under different land use or management activities affect both inherent capability and current suitability for a land use. For example, research might provide insight into how timber harvest pattern affects probability of insect infestation, which will in turn affect the forest's suitability for commercial timber extraction.

8) Biophysical analysis should be integrated into a broader land use planning process in which goals and objectives for land and resources are determined through broad social discussion. This discussion should include all affected interests, and be informed by scientific research and analysis from a wide range of disciplines.

Biophysical analysis is only one technique needed for land planning. It can illuminate resource values and thereby help to meet enunciated objectives. Biophysical information cannot be used by itself for making decisions; biophysical decision rules must be based on previously defined social values.

9) Research into decision criteria and associated land evaluation techniques should be encouraged.

For some currently important social issues such as biodiversity conservation, protecting representative ecosystems, and sustainable development, clear definitions are required from which goals and objectives can be explicitly articulated. Additionally, techniques for combining biophysical and other information to evaluate land for different uses are needed to enable systematic analyses, and to facilitate allocation of land to meet stated objectives.

5.3 Final Comment

While biophysical analysis has limitations as a land use planning technique, its importance should not be underestimated. Biophysical capability - that is, ability of land to produce desired goods and services without being degraded - is a fundamental requirement for all land use activities. Information on biophysical resources is a necessary, but not sufficient input into land planning.

Biophysical analysis can benefit resource planning primarily by helping to focus human and financial resources where they are most needed, by offering an understandable framework for various stakeholders to describe and discuss respectively important resource values, and by assuring land can support the proposed use. For these benefits to be experienced, biophysical analysis must be practiced systematically and economically, and must be complemented with relevant socioeconomic and cultural information. Further, the ability for biophysical analysis to assist in decision making will be improved both if goals and objectives for resources are explicitly articulated, and decision techniques are developed through mutually informed social discussion and scientific research.

Section 6. References

Bailey, Robert G. 1985. The factor of scale in ecosystem mapping. *Environmental Management* 9:271-275.

Bailey, Robert G. 1987. Suggested hierarchy of criteria for multi-scale ecosystem mapping. *Landscape and Urban Planning* 14: 313-319.

Bailey, Robert G. 1988. Problems with using overlay mapping for planning and their implications for geographic information systems. *Environmental Management* 12(1): 11-17.

Bastedo, James D. and John B. Theberge. 1983. An appraisal of inter-disciplinary resource surveys (ecological land classification). *Landscape Planning* 10: 317-334.

Bastedo, Jamie D., J. Gordon Nelson, and John B. Theberge. 1984. Ecological approach to resource survey and planning for environmentally significant areas: the ABC approach. *Environmental Management* 8(2): 125-134.

Beets, M.L. 1982. A wetland classification system that just might work. pp. 29-35. *In*: H.A Stelfox and G.R. Ironside (compilers) *Land/wildlife integration No.2*. Ecological Land Classification Series, No. 17. Ottawa, Ont.: Lands Directorate, Environment Canada.

Belknap, Raymond K. and John G. Furtado. 1967. *Three approaches to environmental resource analysis*. Washington, D.C.: The Conservation Foundation.

British Columbia. 1979a. *Ministry of Forest Act*. Revised Statutues of BC. c. 272.

British Columbia. 1979b. *Forest Act*. Revised Statutues of BC. c. 140.

British Columbia. Forest Resources Commission (BC FRC). 1990. An interim report of the British Columbia Forest Resources Commission. July, 1990. 7 pp.

British Columbia. Climatology Unit, Air Studies Branch. 1981. *Climatic Capability Classification for Agriculture in British Columbia*. APD Technical Paper 4. Victoria, BC.: Assessment and Planning Division, BC Ministry Of Environment. 23 pp.

British Columbia. Ministry of Crown Lands. Land Information Strategic Committee. (BC MoCL). 1989. *A corporate land information strategic plan for the government of British Columbia. Volume 1 Land information infrastructure*. Victoria, BC. 77 pp.

British Columbia. Ministry of Crown Lands. Surveys and Resource Mapping Branch (BC MoCL). 1990. Resource mapping inventory. Victoria, BC. (microfiche).

British Columbia. Ministry of Crown Lands. Maps BC (BC MoCL). no date. Catalogue of regional geochemical survey map packages. Victoria, BC.

British Columbia. Ministry of Energy, Mines, and Petroleum Resources. Land Use Committee (BC MoEMPR). 1984. *Land use policy of the Ministry of Energy, Mines, and Petroleum Resources. Information paper*. Victoria, BC. 27 pp.

British Columbia. Ministry of Energy, Mines, and Petroleum Resources (BC MoEMPR). 1989a. *British Columbia guidelines for mineral exploration.* Victoria, BC. 61 pp.

British Columbia. Ministry of Energy, Mines, and Petroleum Resources. Mineral Resources Division. Geological Survey Branch (BC MoEMPR). 1989b. *Exploration in British Columbia 1988.* Victoria, BC.

British Columbia. Ministry of Energy, Mines, and Petroleum Resources (BC MoEMPR). 1990. British Columbia mineral land use policy. *Mineral Market* 2(2): 17, 25.

British Columbia. Ministry of Environment. Resource Analysis Branch. (BC MoE). 1977. *Aquatic System Inventory and Analysis.* Victoria, BC. 39 pp. + appendices.

British Columbia. Ministry of Environment (BC MoE). 1980. *Guidelines for watershed management of Crown lands used as community water supplies.* Victoria, BC. 44 pp. + appendices.

British Columbia. Ministry of Environment. Assessment and Planning Division (BC MoE). 1982. *Biophysical resources of the Tahsish-Kwois.* APD Bulletin 26. Victoria, BC. 113 pp.

British Columbia. Ministry of Environment. Wildlife Branch (BC MoE). 1989. Regional wildlife habitat map, East Kootenay (1:250,000). Victoria, BC.

British Columbia. Ministry of Environment (BC MoE). 1990a. Submission to the BC Forest Resources Commission.

British Columbia. Ministry of Environment. Resource Quality Section, Water Quality Branch (BC MoE). 1990b. Schedule for reports on water quality objectives and criteria. 9 July, 1990.

British Columbia. Ministry of Forests Inventory Branch (BC MoF). 1981. *Forest landscape handbook.* Victoria, BC. 100 pp.

British Columbia. Ministry of Forests Inventory Branch (BC MoF). 1984. Forest inventory manual. Chapter two, "Environmentally sensitive areas." 129 pp.

British Columbia. Ministry of Forests. Research Branch (BC MoF). 1988a. Biogeoclimatic Zones of British Columbia 1988. Victoria, BC. 1:2,000,000 map.

British Columbia. Ministry of Forests (BC MoF). 1988b. Sunshine Coast TSA timber supply analysis information report. 44 pp.

British Columbia. Ministry of Forests (BC MoF). 1989a. The analysis framework for integrated resource management (AFIRM). Basic concepts. Inventory Branch, BC MoF. Draft report. 6 pp.

British Columbia. Ministry of Forests (BC MoF). 1989b. Draft resource management plan #1 for the Robson Valley Timber Supply Area. 85 pp.

British Columbia. Ministry of Forests (BC MoF). 1990a. *Annual report of the Ministry of Forests for the fiscal year ended March 31, 1989.* Victoria, BC. 91 pp.

British Columbia. Ministry of Forests (BC MoF). 1990b. Sunshine Coast Timber Supply Area Options Report. 22 pp. + app.

British Columbia. Ministry of Forests, Ministry of Environment (BC MoF/MoE). 1990. Procedures for environmental monitoring in range and wildlife habitat management. Victoria, BC. Editorial draft.

British Columbia. Ministry of Forests and Lands, Ministry of Environment (BC MoFL/MoE). 1987. *Coastal Fisheries Forestry Guidelines.* Victoria, BC. 11 pp. + XII app.

British Columbia. Ministry of Parks. Planning and Conservation Services (BC MoP). 1990a. *Preserving our living legacy. Parks Plan 90. Landscapes for BC Parks.* Victoria, BC. 47 pp. + map.

British Columbia. Ministry of Parks. Planning and Conservation Services (BC MoP). 1990b. *Preserving our living legacy. Parks Plan 90. Special features for BC Parks.* Victoria, BC. 47 pp. + map.

British Columbia. Provincial Agricultural Land Commission. 1989. *Agricultural land statistics.* January 1, 1989. Burnaby, BC. 82 pp.

Buchanan, R. J. 1987. Water quality management in British Columbia: a summary. Water Quality Section, Water Management Branch, BC Ministry of Environment. Unpublished paper. 12 pp.

Campbell, David. 1990. Personal communication with range officer. Range Section, Integrated Resources Branch, BC Ministry of Forests. Victoria, BC. 2 October, 1990.

Canada. Agriculture Canada. Canada Soil Survey Committee, Subcommittee on Soil Classification (Canada Agric.). 1978. *The Canadian System Of Soil Classification.* Agric. Canada Publication 1646. Ottawa: Supply and Services.

Canada. Agriculture Canada (Canada Agric.). 1988. Index of soil surveys in British Columbia 1988. Summary brochure.

Canada. Environment Canada (Canada Envir). 1972. *Land classification for forestry.* The Canada Land Inventory. Report No. 4. Ottawa, Ont. 72 pp.

Canada. Environment Canada. Lands Directorate (Canada Envir.). 1978. *The agricultural land reserves of British Columbia: an impact analysis.* Land Use in Canada Series, Number 13. Ottawa, Ont.

Canada. Environment Canada. Lands Directorate (Canada Envir.). 1980. *Land capability classification for wildlife - ungulates. Summary Report.* The Canada Land Inventory Report No. 17. Ottawa, Ont.

Canada. Environment Canada. Lands Directorate (Canada Envir.). 1981. *Land capability classification for wildlife - waterfowl. Summary Report.* The Canada Land Inventory Report No. 16. Ottawa, Ont.

Canada. Lands Directorate, Environment Canada. Federal Environmetnal Assessment Review Office (Canada FEARO). 1980. *Ecological land survey guidelines for environmental impact analysis.* Ecological Land Classification Series, No. 13. Ottawa, Ont. 42 pp.

Canada. Fisheries and Oceans. Habitat Management Division (Canada DFO). 1989. Federal/ provincial fish habitat inventory and information program, Steam information summary system (SISS). Vancouver, BC. 6 p. brochure.

Canada. Fisheries and Oceans. Habitat Management Division (Canada DFO). 1990. Federal/ provincial fish habitat inventory and information program, Steam summary catalogues. Vancouver, BC. 2 p. brochure

Canada. Indian and Northern Affairs (IANA). 1973. *Environmental analysis: a review of selected techniques*. Document No. I0420UC.

Careless, Ric. 1990. Tourism resource sustainable development planning: the Whistler case study. Paper presented at the Globe '90 conference. Vancouver, BC. March 19-23, 1990. 14 pp.

Carlson, Glen. 1990. Personal communication with habitat protection biologist, Fish and Wildlife, BC Ministry of Environment. Surrey, BC. 23 July, 1990.

Chamberlin, T.W. 1980. *Aquatic System Inventory (Biophysical Stream Surveys)*. APD Technical Paper 1. Victoria, BC.: Assessment and Planning Division, Ministry of Environment. 33 pp.

Chamberlin, T.W. 1990. Personal communication with regional manager, Fish and Wildlife, BC Ministry of Environment. Smithers, BC. 12 October, 1990.

Christian, C.S. 1958. The concept of land units and land systems. *Proceedings. Ninth Pacific Science Congress*. 20: 74-81.

Christian, C.S. and G.A. Stewart. 1968. Methodology of integrated surveys. pp. 233-280 *In:* UNESCO. *Aerial Surveys and Integrated Studies*. Paris.

Coombs, Donald B. and J. Thie. 1979. The Canada Land Inventory system. *In*: Marvin T. Beatty, Gary W. Peterson, and Lester D. Swindale (eds.) *Planning the Uses and Management of Land*. Madison, WI: Soil Science Society of America, Inc.

Curtis, Ruth L. 1988. Beyond reach - Council moves to protect prime fish and wildlife habitat. *Northwest Energy News* (Northwest Power Planning Council) 7(5): 7-10.

Daniels, Steven E. 1987. Rethinking dominant use management in the forest-planning era. *Environmental Law* 17: 483-505.

Davis, J.R. 1984. A systematic approach to data collection for planning. *Journal of Environmental Management* 19: 119-131.

Demarchi, D.A. 1982. The use of the biophysical program and capability concepts in mapping ungulate habitats in British Columbia. pp. 44-53. *In*: H.A Stelfox and G.R. Ironside (compilers) *Land/wildlife integration No.2*. Ecological Land Classification Series, No. 17. Ottawa, Ont.: Lands Directorate, Environment Canada.

Demarchi, D.A. 1985. A regional wildlife ecosystem classification for British Columbia. pp. 11-19. *In*: H.A Stelfox and G.R. Ironside (compilers) *Land/wildlife integration No.3*. Ecological Land Classification Series, No. 22. Ottawa, Ont.: Lands Conservation Branch, Canadian Wildlife Service, Environment Canada.

Demarchi, D.A. 1990a. Biophysical habitat classification in British Columbia: a system for mapping mountainous ecosystems. Draft paper prepared for the Landscape Approaches to Wildlife and Ecosystem Management Conference, UBC. May 1990. 14 pp.

Demarchi, D.A. 1990b. Personal communication with habitat classification specialist. Wildlife Branch, Ministry of Environment. Victoria, BC. 6 July, and 10 September, 1990.

Demarchi, D.A., B. Fuhr, B.A. Pendergrast, and A.C. Stewart. 1983. *Wildlife capability classification for British Columbia: an ecological (biophysical) approach for ungulates.* MOE Manual 4. Victoria, BC.: Surveys and Resource Mapping Branch, Ministry of Environment.

Demarchi, D.A. and E.C. Lea. 1989a. Biophysical habitat classification in British Columbia: an interdisciplinary approach to ecosystem evaluation. pp. 275-276. *In*: Dennis E. Ferguson, Penelope Morgan, and Fredreic D. Johnson (compilers). *Proceedings - land classifications based on vegetation: applications for resource management.* November 17-19, 1987, Moscow, Idaho. General Technical Report INT-257. Ogden, UT: USDA Forest Service. Intermountain Research Station.

Demarchi, D.A. and E.C. Lea. 1989b. An example of biophysical habitat mapping in British Columbia. pp.271-274. *In*: Dennis E. Ferguson, Penelope Morgan, and Fredreic D. Johnson (compilers). *Proceedings - land classifications based on vegetation: applications for resource management.* November 17-19, 1987, Moscow, Idaho. General Technical Report INT-257. Ogden, UT: USDA Forest Service. Intermountain Research Station.

Demarchi, D.A., D. Clark, and T. Lea. 1990. Ecological (biophysical) inventoryt, classification and mapping conducted by the British Columbia Ministry of Environment. Draft paper prepared for Wildlife/Forestry Symposium, Prince George, BC. March, 1990. 10 pp.

Department of Regional Economic Expansion (DREE). 1970. *The Canada Land Inventory: objectives, scope, and organization.* Report No. 1. Ottawa, Ont.

Driscoll, Richard S., Daniel L. Merkel, David L. Radloff, Dale E. Snyder, and James S. Hagihara. 1984. *An Ecological Land Classification for the United States.* USDA Forest Service Miscellaneous Publication Number 1439. Washington, DC. 56 pp.

Eng, Marvin A., R. Scott McNay. 1989. *Development of a habitat assessment and planning tool: a problem reference and project working plan.* Integrated Wildlife Intensive Forestry Research IWIFR-40. Victoria, BC.: BC Ministries of Environment and Forests. 41 pp.

Eng, Marvin A., R. Scott McNay, and Rick E. Page. 1990. Integrated management of forestry and wildlife habitat with the aid of a GIS-based habitat assessment and planning tool. pp. 185-190. *In*: Forestry Canada. *Making it work.* Symposium Proceedings. GIS '90 Conference. Vancouver, BC. March 19-23, 1990.

Environment and Land Use Committee Secretariat (ELUCS). 1976. *Terrain classification system.* Victoria, BC.: Resource Analysis Branch, BC Ministry of Environment. 56 pp.

Friend, A. 1979. Ecological mapping and socio-economic statistics. pp.115-126. *In*: C.D.A. Rubec (ed.) *Applications of ecological (biophysical) land classification in Canada.* Ecological Land Classification Series No. 7. Ottawa, Ont.: Lands Directorate, Environment Canada.

Ferguson, Bruce K. 1981. The use of overlays in site quality mapping. *Canadian Journal of Forest Research* 11: 361-369.

Fontaine, Janet. 1990. Personal communication with coordinator, Land Use Policy, Mineral Resources Branch, Mineral Resources Division, British Columbia Ministry of Energy, Mines, and Petroleum Resources. Victoria, BC. 18 October, 1990.

Gelinas, R. 1986. Development and application of "environomic units": hybrid map units designed to integrate environmental and socio-economic data for land modelling. pp. 69-85. *In*: R. Gelinas, D. Bond, and B. Smit (eds.). *Perspectives on land modelling.* Montreal Que.: Polyscience Publications Inc.

Gotmark, Frank, Matti Ahlund, and Mats O.G. Eriksson. 1986. Are indices reliable for assessing conservation value of natural areas? An avian case study. *Biological Conservation* 38: 55-73.

Green, R.N., P.J. Courtin, K. Klinka, R.J. Slaco, and C.A. Ray. 1984. Site diagnosis, tree species selection, and slashburning guidelines for the Vancouver Forest Region. Land Management Handbook 8. Victoria, BC: BC Ministry of Forests.

Gryzbowski, Alex. 1990. Personal communication with manager, resource planning. Tourism Planning and Resource Management, BC Ministry of Tourism, Victoria, BC. 17 July, 1990.

Hall, George R. 1963. The myth and reality of multiple use forestry. *Natural Resources Journal* 3 (October): 276-290.

Hall, Peter. 1975. *Urban and regional planning.* New York: Wiley. 312 pp.

Harrison, E.F. 1981. *The managerial decision-making process.* Boston MA.: Houghton Mifflin. 390 pp.

Hawes, R.A., D.S. Lacate, and L.M. Lavkulich. 1976. A landscape approach useful to regional land use planning. Victoria, BC.: Environment and Land Use Committee.

Herbig, R.A. 1986. Application of GIS technology to the HEP habitat layers model. pp. 211-223. *In*: R. Gelinas, D. Bond, and B. Smit (eds.). *Perspectives on land modelling.* Montreal Que.: Polyscience Publications Inc.

Hills, G. Angus, David V. Love, and Douglas S. Lacate. 1970. *Developing a Better Environment: Ecological Land-use Planning in Ontario.* Toronto, Ont.: Ontario Economic Council. 182 pp.

Hopkins, Lewis D. 1977. Methods for generating land suitability maps: a comparative evaluation. *Journal of the American Institute of Planners* 43: 386-400.

Howes, Don E. 1987. A terrain evaluation method for predicting terrain susceptible to post-logging landslide activity. Victoria, BC.: Recreational Fisheries Branch. Ministry of Environment. 38 pp.

Howes, Don E. 1990. Personal communication with sensitivity mapping specialist. Policy and Planning Branch, Ministry of Environment, Victoria, BC. 17 July and 11 September, 1990.

Howes, Don E. and E. Kenk (eds.) 1988. Terrain classification system for British Columbia (Revised edition). MOE Manual 10. Recreational Fisheries Branch, Ministry of Environment and Surveys and Mapping Branch, Ministry of Crown Lands. Victoria, BC. 90 pp.

Inselberg, A.E., K. Klinka, and C. Ray. 1982. *Ecosystems of MacMillan Park on Vancouver Island*. Land Management Report 12. Victoria, BC: BC Ministry of Forests.

Jakimchuk, R.D. 1982. The "what" and "why" of habitat inventory. pp. 7-15. *In*: H.A Stelfox and G.R. Ironside (compilers) *Land/wildlife integration No.2*. Ecological Land Classification Series, No. 17. Ottawa, Ont.: Lands Directorate, Environment Canada.

Kenk, E., M.W. Sondheim, and H. Quesnel. 1987. *CAPAMP Volume 1. BC Ministry of Environment and Parks Thematic Mapping Geographic Information System. Data entry and validation procedures for soil, agriculture capability, surficial geology, and the all purpose entity*. MoEP Manual 10. Victoria, BC.: BC Ministry of Environment and Parks

Kimmins, J. P. 1979. Ecological classification of forest land in Canada and northwestern U.S.A.: report on the 1977 Vancouver symposium. pp. 51-56. *In*: C.D.A. Rubec (ed.) *Applications of ecological (biophysical) land classification in Canada*. Ecological Land Classification Series No. 7. Ottawa, Ont.: Lands Directorate, Environment Canada.

Klinka, K, R.N. Green, P.J. Courtin, and F.C. Nuszdorfer. 1984. *Site diagnosis, tree species selection, and slashburning guidelines for the Vancouver Forest Region*. Land Management Handbook 25. Victoria, BC: BC Ministry of Forests.

Klinka, K., R.E. Carter, and M.C. Feller. 1990a. Cutting old-growth forests: ecological considerations for forest regeneration. Paper submitted to *Northwest Environmental Journal*. 32 pp.

Klinka, K:, R.N. Green, D.V. Meidinger, and D.S. McLennan. 1990b. *Biogeoclimatic ecosystem classification*. Victoria, BC: BC Ministry of Forests. 8 pp. brochure

Krajina, V.J. 1969. Ecology of forest trees in British Columbia. *Ecology of Western North America* 2: 1-146.

Lacate, D. S. (compiler). 1969. *Guidelines for biophysical land classification*. Subcommittee on Biophysical Land Classification, National Committee on Forest Land. Department of Fisheries and Forestry. Publication No. 1264. Ottawa, Ont.: Canadian Forestry Service.

Lang, Andrea, 1990. Personal communication with timber supply analysis forester, Resource Planning Section, Integrated Resources Branch, BC Ministry of Forests. Victoria, BC. 25 October, 1990.

Lea, E.C. 1984. *Biophysical resources of the East Kootenay area: vegetation*. Volume 1. MOE Technical Report 5. Ministry of Environment. Victoria, BC. 75 pp.

Lea, E.C. 1986. Vegetation of the Wells Gray study area. MOE Technical Report 21. Ministry of Environment. Victoria, BC. 96 pp.

Lewis, Peter. 1990. Personal communication with Head, Habitat Assessment Unit, Habitat Management Section, Recreational Fisheries Branch. BC Ministry of Environment. Victoria, BC. 11 September, 1990.

Louie, R. 1990. Personal communication with head, Soils Unit, Policy and Planning Branch, British Columbia Ministry of Environment. Victoria, BC. 12 October, 1990.

Luff, D.O. and P.M. Ojaama. 1979. The value of ecological (biophysical) land classification in land use planning: an Alberta example. pp. 303-316 *In*: C.D.A. Rubec (ed.) *Applications of ecological (biophysical) land classification in Canada*. Ecological Land Classification Series No. 7. Ottawa, Ont.: Lands Directorate, Environment Canada.

Luttmerding, H.A., D.A. Demarchi, E.C. Lea, T. Vold, and D.V. Meidinger. 1990. *Describing ecosystems in the field*. 2nd ed. Victoria, BC.: BC Ministries of Environment and Forests.

MacKinnon, A., D. Meidinger, and K. Klinka. 1988. Use of the biogeoclimatic ecosystem classificaiton system in British Columbia. Victoria, BC.: Research Branch, BC Ministry of Forests. Unpublished report. 45 pp.

McHarg, Ian L. 1969. *Design With Nature*. Garden City, NY: The Natural History Press. 198 pp.

Maynard, Denny. 1979. *Terrain capability for residential settlements: summary report*. Victoria, BC.: Resource Analysis Branch, BC Ministry of Environment. 61 pp.

Meidinger, Del. 1990. Personal communication with classification program correlator, Integrated Resource Management Section, Research Branch, British Columbia Ministry of Forests. Victoria, BC. 11 September, 1990.

Mitchell, W.R., R.E. Green, D.Lloyd, F. Russell, W.Erickson, and D. Walken. 1981. Identification and interpretation of ecosystems of the western Kamloops forest region. First approximation. Land Management Handbook 2. Victoria, BC.: BC Ministry of Forests.

Morin, R.L., E.E. Derenyi, R.W. Wein, and R. Yazdani. 1986. Up-dating landscape data for natural resource management through LANDSAT imagery. pp. 167-171. *In*: R. Gelinas, D. Bond, and B. Smit (eds.). *Perspectives on land modelling*. Montreal Que.: Polyscience Publications Inc.

Munn, Bill. 1990. Personal communication with park system planner, Planning and Conservation Services, British Columbia Ministry of Parks. Victoria, BC. 26 September, 1990.

Murray, Ted. 1990. Personal communication with recreation analysis specialist, Recreation Section, Integrated Resources Branch, British Columbia Ministry of Forests. Victoria, BC. 11 Spetember, 1990.

O'Riordan, J. 1976. Approaches to land use planning in British Columbia. Presented to Pacific Northwest Regional Economic Conference. Victoria, BC. 5 pp.

Outdoor Recreation Council of British Columbia (ORC). 1990. Keeping track of outdoor recreation. Brochure co-published with BC Ministry of Forests.

Pattison, Alan M. 1984. Biophysical land systems: an alternative approach for synthesizing biophysical data for land use planning. Natural Resources Management Program Report 19. Burnaby, BC: Simon Fraser University. (unpublished)

Pojar, J. (ed.) 1983. Forest ecology. pp. 221-318 *In*: Susan B. Watts (ed.) *Forestry Handbook for British Columbia*. 4th ed. Vancouver, BC: The Forestry Undergraduate Society, Faculty of Forestry, University of British Columbia.

Pojar, J., K. Klinka, and D. V. Meidlinger. 1987. Biogeoclimatic ecosystem classification in British Columbia. *Forest Ecology and Management* 22: 119-154.

Quin, A.L. 1979. The use of ecological information in settlement planning - a case example. pp. 335-344. *In*: C.D.A. Rubec (ed.) Applications of ecological (biophysical) land classification in Canada. Ecological Land Classification Series No. 7. Ottawa, Ont.: Lands Directorate, Environment Canada.

Rees, William E. 1979. The Canada Land Inventory and its impact on regional planning. pp. 159-171. *In*: I. Robinson and W. Perks (eds.) *Urban and Regional Planning in a Federal State: the Canadian Experience*. Montreal, Que.: McGraw-Hill.

Reksten, Don. 1990. Integrated watershed management planning. Victoria BC.: Water Management Branch, BC Ministry of Environment. Unpublished report. 13 March, 1990.

Rowe, J. S. 1979. Revised working paper on methodology/ philosophy of ecological land classification in Canada. pp. 23-29. *In*: C.D.A. Rubec (ed.) *Applications of ecological (biophysical) land classification in Canada*. Ecological Land Classification Series No. 7. Ottawa, Ont.: Lands Directorate, Environment Canada.

Rowe, J.S. 1980. The common denominator of land classification in Canada: an ecological approach to mapping. *Forestry Chronicle* 56: 19-20.

Rowe, J. Stan and John W. Sheard. 1981. Ecological land classification: a survey approach. *Environmental Management*: 5(5): 451-464.

Runka, G.G., and T. Lewis. 1981. *Preliminary wetland managers manual - Cariboo Resource Management Region*. APD Technical Paper 5. Victoria, BC.: Assessment and Planning Division. BC Ministry of Environment.

Ryder, June M. 1981. *Biophysical resources of the East Kootenay area: terrain*. APD Bulletin 7. Victoria, BC.: Assessment and Planning Division. Ministry of Environment. 152 pp.

Ryder, June M. and Don E. Howes. 1984. *Terrain information: a user's guide to terrain maps in British Columbia*. Victoria, BC.: BC Ministry of Environment. 16 pp.

Schwab, J. 1990. Personal communication with geomorphologist, Forest Sciences Section, British Columbia Ministry of Forests. Smithers, BC. 12 September, 1990.

Smith, Paul G. R. and John B. Theberge. 1987. Evaluating natural areas using multiple criteria: theory and practice. *Environmental Management* 11(4): 447-460.

Sondheim, M. 1990. Personal communication with head, Geomatics Unit, Topo/GIS Section, Surveys and Resource Mapping Branch, British Columbia Ministry of Crown Lands. 18 October, 1990.

Sondheim, M. and K. Suttie. 1983. User manual for the British Columbia Soil Information System. BCSIS Volume 1. Victoria, BC:. BC Ministry of Forests. 70 pp.

Spandli, Imre. 1990. Personal communication with manager, Inventory Section. BC Ministry of Forests. Victoria, BC. 10 September, 1990.

Sprout, P.N. 1978. The Canada Land Inventory period 1965-1975. pp. 183-191. *In*: K.W.G. Valentine, P.N. Sprout, T.E. Baker, and L.M. Lavkulich (eds.) *The Soil Landscapes of British Columbia*. Victoria, BC.: Resources Analysis Branch, BC Ministry of Environment.

Steen, O. A. and A. L. Roberts. 1988. *Guide to wetland ecosystems of the very dry montane interior Douglas-fir subzone eastern Fraser Plateau variant (IDFb2) in the Cariboo Forest Region*. Land Management Report 55. VictoriaBC.: BC Ministry of Forests.

Steiner, Frederick. 1983. Resource suitability: methods for analysis. *Environmental Management* 7(5): 401-420.

Thomae, Oliver. 1990. Personal communication with resource officer, Planning, British Columbia Ministry of Forests. Sqamish, BC. 25 October, 1990.

Tsitika Planning Committee. 1978. *Tsitika Watershed Integrated Resource Plan. Summary Report*. Victoria, BC. 52 pp. + app.

Turner, Monica G. 1989. Landscape ecology: the effect of pattern on process. *Annual Review of Ecological Systematics* 20: 171-97.

Urban, Dean L., Robert V. O'Neill, and Herman H. Shugart Jr. 1987. Landscape ecology. *Bioscience* 37(2): 119-127.

Vink, A.P.A. 1983. *Landscape Ecology and Land Use*. London, England: Longman House. 264 pp.

Vold, Terje. 1977. *Biophysical soil resources and land evaluation of the northeast coal study area, 1976-1977*. Volume 1. Victoria, BC.: Resource Analysis Branch. Ministry of Environment.

Vold, Terje. 1978. Reconnaissance biophysical soil inventories in British Columbia: a case study of the northeast coal area. pp. 403-411. *In*: H.G. Lund, Vernon J. LaBau, P.F. Ffolliott, D.W. Robinson (tech. coords.) *Integrated Inventories of Renewable Natural Resources: Proceedings of a Workshop*. General Technical Report GTR-RM-55. Fort Collins, CO.: USDA Forest Service. Rocky Mountain Forest and Range Experiment Station.

Vreeswijk, W.J. 1985. Integrated resource management plan implementation: The Tsitika watershed example, British Columbia. Natural Resource Management Program Report Number 25. Burnaby, BC.: Simon Fraser University. (Unpublished). 128 pp.

Walmsley, M. E. 1977. Biophysical land classification in British Columbia: the philosophy, techniques, and application. *In*: J. Thie and G. Ironside (eds.) *Ecological (biophysical) classification in Canada*. Ecological Land Classification Series No. 7. Ottawa, Ont.: Lands Directorate, Environment Canada. pp. 3-22.

Walmsley, M. E., G. Utzig, T. Vold, D. Moon, and J. van Barneveld. 1980. *Describing ecosystems in the field.* Technical Paper 2. British Columbia Ministry of Environment Resource Analysis Branch. Land Management Report 7. Victoria, BC.: BC Ministry of Forests. 224 pp.

Westman, Walter E. 1985. *Ecology, Impact Assessment, and Environmental Planning*. Toronto, Ont.: John Wiley and Sons. pp. 201-268.

Whittaker, Robert H. 1978. Approaches to classifying vegetation. pp. 3-31. *In*: R.H. Whittaker (ed.) *Classification of plant communities.* Hague: Junk.

Wiken, E.B. and G. Ironside. 1977. The development of ecological (biophysical) land classification in Canada. *Landscape Planning* 4: 273-282.

Wiken, E.B. 1986. *Terrestrial ecozones of Canada*. Ecological Land Classification Series No. 19. Ottawa Ont.: Lands Directorate. Environment Canada. 26 pp.